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Errata—
Page 144, line 6 from top, for "Medium" *read* "Medicine."
Page 447, title to plate, for "Pericillium glaucum" *read* "Penicillium."

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VOL. XVIII. PART 1. JANUARY 2, 1907.

Agricultural Gazette of New South Wales.

Farmers' Sheep.

HINTS FOR BEGINNERS.

R. W. PEACOCK,
Bathurst Experimental Farm.

IN the wheat-growing districts the farmers have learned the value of sheep upon the farm. Sheep and wheat fit admirably into the up-to-date practice upon large tracts of agricultural lands in Australia.

Many pastoralists were induced, a few years ago, on account of the low price of sheep, to take up wheat growing. Latterly, owing to the high prices

Feeding off Black Tares, Bathurst Experimental Farm.

of both wool and mutton, many farmers have taken up sheep, and have found them profitable. Generally speaking, the farmers lacked a previous knowledge of this, at present, important branch of their calling.

There are many desirous of attempting this system of mixed farming, and are anxious to obtain information respecting the best lines upon which to commence. It is for these that the following notes are written, and not for the man who knows all about the business.

There is a considerable difference between a farmer's sheep and a squatter's sheep.

It is comparatively easy to grow wool, but it is more difficult to produce high-grade lambs for export. The farmer should produce more than wool; the rearing of fat lambs comes specially within his province, as he monopolises that portion of the State most suitable for the maintaining of a uniform supply for the export trade. Intermittent supplies are most unsatisfactory, and owing to the vicissitudes of our climate such have been the rule in the past. The farmer, by the aid of his plough and good management, can largely overcome the many disadvantages in this respect, and it is to him that we must look for the supply of lambs in other than fair, average, or good seasons.

Upon farms where only a few hundreds of sheep are kept, it is imperative that they be worked to the best advantage, and to do this involves considerable foresight on the part of the farmer. There are so very many points to be taken into consideration that it is wise for him to make himself as conversant as possible with a business which is, generally speaking, new to him, and about which he cannot obtain much help from the pastoralist. He must first fit his farm for the carrying of sheep in conjunction with the growing of crops, which very often entails the remodelling of his fences and the erection of others for subdivisions. The fences which he had found efficient against the larger stock may be sadly wanting when the cross-bred comes on to the scene. A good sheep-proof boundary fence and suitable subdivision fences are imperative. These are best constructed with wire-netting—rabbit-proof for the boundaries and marsupial netting for the subdivisions. Barbed-wire should be placed above the netting to protect it from other classes of stock. Fences with ordinary wires may be made sheep-proof by arranging the wires close together, but are never as satisfactory as the netting. The height of the subdivision fences and the netting must be considered in relation to the class of mixed farming to be practised; if cattle and horses are carried in conjunction with sheep they will of necessity have to be higher and more substantial.

Water Supply.

A good water supply is very important. To keep sheep in good condition they should not have to travel far during the hot weather for water. Where it has to be supplied by the excavation of tanks or erection of dams the dimensions must be considered in relation to the local conditions, data of which can usually be obtained from old local residents, and many of these have materially modified their former opinions since the drought of 1902. Where deep excavations are necessary to retain water it is preferable to fit them with wind-mill pumps and troughing, thus making the most of the water and keeping the wool cleaner, &c. The water supply must be taken into consideration in the subdividing of the farm, and very often one tank could be made to supply four (4) paddocks.

Capacity of the Farm.

The farmer should decide upon a well thought out plan of operations, and calculate the number of acres upon which the sheep can graze, and also the amount of fodder derivable from his various crops, leaving a reasonable margin as insurance against risk in unfavourable seasons. Overstocking would soon place him in the position of a wool grower only, and not a lamb raiser. Only actual experiment upon the part of himself or his neighbours can throw light upon this question. It is preferable to very much under-stock for a time rather than over-stock.

Selection of Ewes.

Having decided upon the capacity of his farm it will be necessary to select his breeding ewes, giving full consideration to the fact that probably these will give about 90 per cent. of lambs, which will, under the most favourable conditions, eat a considerable amount of fodder for fully three (3) months of the year in addition to their mothers' milk. Of merino ewes the farmer has many to choose from. The small man is always at a disadvantage in purchasing small lots. The pastoralist prefers to sell in large drafts. Of cross-bred ewes the supply is limited. A few breeders have considered it advisable to cater for this trade, but so far the supply is not equal to the demand. This means that such ewes are commanding high prices. Of comeback ewes there is also a limited supply. Of nondescripts there are far too many, and these should be strenuously avoided. The ewes purchased should be all of one class, and preferably of one age and ear-mark. Small mixed lots from dealers or saleyards always prove unsatisfactory, as the wool from such is so mixed as to command but the lowest prices, and the progeny lacks that uniformity so necessary to command the best figures under the hammer.

Uniformity of both wool and progeny cannot be neglected by the farmer desirous of getting the best results. No matter how careful he may be in his original purchases he will soon have need to cull for himself without purchasing culls in the first instance.

Whether merinos, comebacks, or cross-breds are to be purchased must be decided according to the condition of the market and character of the country. A farmer cannot neglect the question of wool upon his breeders, and they should be selected on account of their quality in this respect, in conjunction with their constitution, frame, freedom from disease, and other desirable qualities.

From a wool point of view the merino and comeback are the best. From the point of prolificness the cross-bred is easily first. The cross-breds also make better mothers, they giving more milk than the merino; the comebacks are probably intermediate in this respect.

Ewes with any sign of disease should be rejected, and not trust to a change of conditions to remedy the evil. It is much easier for the novice to succeed with healthy sheep. The combating of diseases should be left to the experienced. The many symptoms of diseases cannot be enumerated here,

but the novice should familiarise himself with a few points peculiar to healthy, robust sheep. Pink skins, well-sprung ribs, deep bodies, sprightly carriage, well-developed muzzles, well-conditioned wool, and good condition, are reliable evidences of health and constitution. Anæmic white skins, white or yellow eyelids, distended stomachs, arched backs, lameness, wool in bad condition, and emaciated frames, except under droughty conditions, are sufficient evidences of either fluke, worms, foot-rot, or kindred diseases, which it is advisable for the beginner to give a wide berth.

Age of Sheep.

Age is of considerable importance, as it materially affects the quantity and quality of the wool. Merinos carry their wool in quantity and quality the longest, comebacks next, and cross-breds go off very rapidly after they are full-mouthed.

From a wool point of view very old sheep are extremely undesirable, and sheep must have good mouths to withstand hardships. For all practical purposes the age of a sheep is told by its teeth, principally the incisors. A lamb, a few days after birth, and sometimes at birth, has eight (8) temporary incisors or, as they are sometimes called, "sucking" teeth. The replacing of these with permanent teeth varies somewhat in different animals and breeds. Generally speaking, the central pair of temporary incisors are replaced by permanent ones at 1 year old, varying from 12 to 16 months. The second pair appear at from 18 to 24 months. The third pair may appear at from 2 years and 3 months to 2 years and 9 months. The fourth pair may appear at from 3 years to 3 years and 6 months. The sheep is then said to be full-mouthed. During these ages a sheep is termed: whilst only having temporary incisors and still sucking its mother, a "lamb" or a "sucker"; after weaning, at from 5 or 6 months of age, until cutting its two permanent incisors, a "weaner"; with two permanent incisors, a "two-tooth" or "hogget"; with four permanent incisors, a "four-tooth"; with six permanent incisors, a "six-tooth"; with eight permanent incisors, a "full-mouthed" sheep; when commencing to lose its permanent incisors, from age or other causes, a "broken-mouth" sheep. After having lost its permanent incisors it is called a "gummy."

In the cutting of their teeth sheep may suffer from sore or tender mouths, which may sometimes seriously interfere with their condition, especially if fed upon dry grass or fodder. At these periods they do better upon soft succulent grasses and herbs. A sheep with only two permanent incisors and six temporary ones cannot be expected to thrive under harsh conditions as would one with a more perfect mouth. This applies more especially to young ewes suckling lambs; such cannot do justice to their lambs and also build up their own frames and produce a satisfactory clip of wool. Under other than very favourable conditions both ewe and lamb suffer.

Generally speaking, young ewes require very favourable keep, and where such is not to be depended upon, it is wiser to breed from ewes at 3 years old or over.

In the production of fat lambs it generally follows that the larger the proportion of blood of the English breeds in the sire and dam, when bred upon suitable lines, the better from a mutton point of view, and the worse from the standpoint of wool. The reverse is the case when there is a preponderance of well-bred merino blood: there is a falling off in the size of carcass and early maturing characteristics, and a corresponding increase in the character and quantity of wool. A judicious combination of these desirable characteristics should be aimed at, with various modifications to be decided by the farmer after gauging the possibilities of his country. This desirable combination should not be neglected in the breeding of ewes. As regards their progeny, early maturity and quality of carcass is of greater importance, especially when the conditions invariably allow of their disposal

Feeding off early Wheat crop.

as sucking lambs. When the conditions are not so stable, and the progeny may have to be carried over and shorn, wool is of greater importance. It is possible that in aiming for such, early maturity and fattening propensities may be sacrificed, and the necessity for holding over rendered more frequent. This is one of the crucial points of the business, requiring considerable judgment and experience. The farmer should minimise such risks as much as possible by making provision, and aiming continually at prime lambs to be marketed at from 4 to 5 months old.

It may also be desirable, when breeding for mutton, to follow somewhat different lines as when breeding for lambs, as some breeds or crosses may produce excellent quality lambs, but when held over and fattened at heavy weights give mutton which may be coarse and tallowy.

To lay down any hard and fast rules for cross-breeding is impossible. The farmer must become conversant with the various characteristics of the various breeds at his command, and breed upon such lines as will suit his conditions. The ewes which could be used to advantage are the following:—Merino ewes, with good constitutions, good frames, wool of good quality but not in excessive quantity, and chosen carefully as regards uniformity. These possess the advantage of being readily obtained, the supply being large. When mated with pure rams of the various English breeds the progeny are excellent for the lamb trade, with decent treatment. If held over they cut heavy fleeces; the ewes are in demand for breeders, and the wethers mature into very desirable weights of good quality for the mutton trade. The merino mothers cut good fleeces of wool, not so liable to market fluctuations as those of the cross-breds.

Cross-bred ewes.—By the term cross-bred I mean, in this instance, the progeny of the pure English rams and pure merino ewes bred as above. These, if selected for evenness and quality of covering, and bred upon desirable lines, such as Lincoln-merino, English-Leicester-merino, Border-Leicester-merino, or Romney Marsh-merino crosses, cut profitable fleeces of very saleable wool. They are better mothers than the pure merino, are more prolific, and the mortality amongst the ewes at lambing is not so great as when mated with the large-framed English rams. When mated with rams of the Downs breeds the resultant progeny mature early, fatten readily, and make lambs of desirable quality. Their wool shows a falling off in quantity and quality, as compared with their dams, and for this reason they should not be kept for breeders. The object should be to sell as lambs.

Comeback ewes.—These ewes are the progeny of cross-bred ewes, such as the abovementioned, by pure merino rams; they are three-quarter merino and one-quarter of the British breeds. These in common with the cross-breds should be carefully selected as to covering. The proportion of the long-woolled British sheep gives to the fleeces a desirable length of staple, which commands good prices as a strong combing wool. They are probably intermediate between the merino and cross-bred as regards frames, prolificacy and mortality at lambing. They are a desirable class of sheep when bred upon good lines and severely culled.

It will be noted that I have mentioned only the long-woolled British breeds in the breeding of ewes for cross-breds and comebacks. As the wool of the breeders is an important consideration the reason will be apparent. One of the disadvantages of this system is, that the progeny from the long woolled breeds are not generally so hardy under adversity as those of the short-woolled British breeds. Under certain conditions it might be desirable to sacrifice some wool upon the dams and reverse the order in using the various British breeds, or even to produce lambs containing three quarters of Downs or similiar blood and one quarter merino. Such crosses from a lamb point of view are hard to surpass. They are wanting as regards wool.

Selection of Rams.

The selection of suitable rams from which to obtain the best results calls for a considerable knowledge of the British breeds which are available. They may be divided into two classes, the long-woolled and the short-woolled. The former class comprises the Lincoln, English-Leicester, Border-Leicester, and Romney Marsh; the latter the Shropshire and the Southdown. There are several other breeds, but they are not yet bred in sufficient numbers to be available to the farmers of this State.

The Lincoln is the greatest favourite of the long-wools, and has been used with excellent results under many conditions. Its covering is the strongest of all the British breeds, and to get the best results from a wool point of view, should be mated with fine-woolled merino ewes. The wool from this cross finds ready sale, and heavier weights are cut than from any other. The quality of the lambs is good; a preponderance of this blood in heavy-weight wethers is apt to induce coarseness of mutton and too large a proportion of fat. The influence of the merino has a tendency to counteract this defect. They require comparatively good keep, thriving best upon rich pastures. Owing to their large frames and heads, there is under certain conditions losses of merino ewes at lambing time. The same applies to the Border-Leicester, Romney Marsh, and Shropshire; the English-Leicester and Southdown giving less trouble in this respect.

The English-Leicester.

When rams of this breed are mated with merino ewes the wool is finer than that from the Lincoln cross; they are not such heavy cutters. The lambs are of good quality. The remarks upon the heavy-weight Lincoln cross wethers apply to this cross. They require good keep. The carcass weights are not so heavy as the former.

Border-Leicester.

The wool of the Border-Leicester-merino cross is very satisfactory in quality; in quantity it falls below the Lincoln cross. The lamb and mutton are of good quality. They are hardier than the Lincolns or English-Leicesters. They incline too much to legginess, and on account of their well-sprung ribs and broad shoulders merino ewes experience trouble whilst lambing to these rams.

Romney Marsh.

From the cross with the merino the wool compares favourably, in both quality and yield, to the former. The lamb and mutton are not so favourably received in the English market as those abovementioned.

The strong point of the breed and its crosses is their ability to thrive in damp situations, they being supposed to resist in a greater measure than other breeds the attacks of worms, fluke, and foot-rot.

The Shropshire.

This breed is the most popular of the Downs for crossing. During the last few years considerable attention has been given to the improvement of

its covering, the result being a desirable combination of wool and mutton qualities not as yet possessed by the other short-woolled breeds. The wool from the Shropshire-merino ewe approaches the merino more than the other crosses, the best classes being a good commercial wool not so liable to market fluctuations as many of the former. The yield is not so heavy as from the long-woolled crosses. The quality of the lamb and mutton is excellent. Its early maturing qualities and aptitude to fatten under Australian conditions have made this cross very popular. It thrives upon lighter pastures than those of the long-wools.

The Southdown.

From a mutton point of view the Southdown holds premier position. From the standpoint of wool it is the lowest of any of the above. Its symmetrical carcass, with well-filled legs of mutton, and large proportion of lean meat, make it exceptionally attractive on the hooks. Its excellent reputation for the quality of its mutton ensures the highest prices for both lamb and mutton.

It thrives upon lighter pastures than the long-wools. On account of its comparatively small bone very little trouble is caused at lambing when merino ewes are mated with rams of this breed.

The value of a ram in breeding depends upon his special characteristics for the purposes required, and his power to transmit these desirable characteristics to his progeny. This quality of prepotency in a ram is difficult to gauge without an actual knowledge of his offspring. Evidences of such in the general form and style are not apparent to the novice, but may become so after considerable experience.

Purity of breeding is very important as regards prepotency, especially when descended from families of the desirable qualifications. Pedigree is the only safeguard of purity. Other things being equal, line-bred rams will prove more prepotent than others not so bred.

Badly bred or cross-bred rams should never be used, as such cannot be depended upon. Such rams mated with merino ewes of good breeding are overruled by the prepotency of the ewes. Pure-bred English rams, when mated with cross-bred ewes, exercise a greater influence upon the progeny than when mated with pure merino ewes. This is of considerable importance when breeding for lamb and mutton.

Good rams are essential to success.

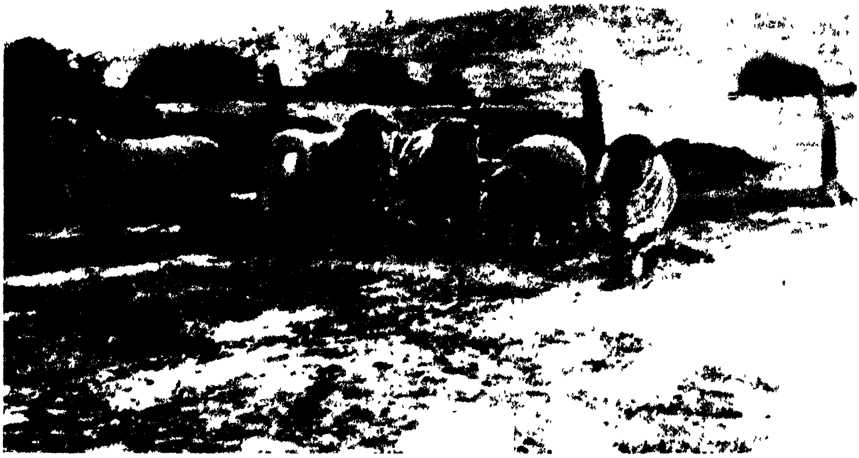
The testing for mutton characteristics in the live sheep is not an easy matter for the novice, and can only be learned by long experience in handling. A good practice is to handle and afterwards slaughter and observe carefully the proportion of lean meat, fat, and general covering of the carcass.

In mutton sheep the hindquarters should be well developed. Well developed ribs and good chest expansion are essentials. The frame should be well covered with firm flesh. A rubbery feeling along the back indicates the presence of a desirable amount of lean meat. The vertebral column at the shoulders should not stand up prominently and narrow. The back should be wide and broad, and also the loin. The leg should have a full

plump twist and be fleshed well down to the hock. When in the best condition, the flesh along the backbone should be of a mellow and elastic character, and the backbone should not be readily felt. Across the loin the meat should rise higher than the vertebral column, which should appear as in a depression. The tail should be broad and well covered. Heavy masses of fat at the tail are not desirable. Dark meat is objectionable, and pink skins are an indication of well-coloured flesh.

Mating the Ewes.

Having purchased the ewes and the rams, the question of mating calls for consideration. When to mate must be considered in relation to the



Pure-bred Shropshire Rams, twelve months.

quality of the country and the climate. For the production of fat lambs it is wise to mate so that the lambs will be about 2 or 3 months old when there is an abundance of green feed upon which to top them off for market, as they should be marketed before the grass seeds become troublesome, at from 4 to 5 months old. The shearing season must also be considered, and it is preferable for the lambs to be about 3 or 4 months old at that time. Such may necessitate the growth of crops for the ewes during the winter, which should easily be done on any well-managed farm. Shelter should also be provided for lambing ewes in wet and cold weather. The gestation period of ewes varies from about 142 to 154 days, with about an average of 146 days, or, roughly speaking, 5 months. This would mean that ewes mated in February would be due to lamb in June, which in my opinion is a desirable

month for farmers' sheep, as it is easier for him to provide green fodder during the winter and spring, and such fits in better with his farm practice. It is not always possible to get sheep to mate when desired, and such should be taken into consideration when purchasing the ewes. Generally speaking it is not difficult to arrange for a lambing from ewes one month earlier than the previous season. It may not be easy to arrange for an autumn lambing from ewes which previously lambed in the spring. No hard and fast rule can be laid down, as much depends upon the nature of the season and quality of pasture.

During the mating, the ewes should be in good condition, and, if possible, turned upon better pastures, as such ensures a larger percentage of lambs and a greater proportion of twins. High percentages of lambs are never obtained under adverse conditions. It is possible for ewes to be too fat, but such is not often the case.

The rams also should be well fed. The proportion of rams to ewes should be about one to fifty or sixty. The rams should be left with the ewes not less than five weeks, and preferably for seven and a half weeks where large percentages are desired and there are no disadvantages from a prolonged lambing. It is undesirable to have the rams too fat before mating. They should be in good condition and have had plenty of exercise for fully a month previously. If the rams are too fat they should be only yarded with the ewes at night for the first week. Both rams and ewes should be shorn a few months before mating, as best results are not obtained directly after shearing.

After mating the ewes should not be allowed to get into low condition, as such will add to the troubles at lambing, especially when mated with large-framed rams. The lamb when dropped from a store or poor ewe is larger than from a fat one, and the poor ewe at lambing has not the stamina to help her over the critical period as has the fat one.

A paddock within reasonable distance of the homestead should be reserved for the lambing, as considerable attention may be required. The paddock should be sheltered from the cold winds if possible. If in an exposed position, artificial shelter should be provided. Break-winds of pines, and hedges of privet, tree lucerne, salt-bush, or box thorn could be planted to advantage for this purpose.

To ensure good lambs, the ewes must be well fed and the lambs should have access to green feed when old enough to graze. They should not be allowed to receive a serious check. A diet of solely dry fodder or dry grass is disastrous. The lambs should be kept fat, and topped off at from 4 to 5 months old, and sold as suckers weighing from 28 to 42 lb. These are the weights most acceptable to buyers for the export trade. If it is not possible to keep them prime and sell as lambs, they should be shorn and fattened the first opportunity and marketed as weaners or hoggets. Heavy weights do not command the highest prices, and sheep weighing 50 to 60 lb. may realise more per head than much heavier ones. It is an age of small joints, and at present large sheep are not in favour, and have a restricted market.

For this reason it is not wise to purchase abnormally large rams of any breed, as quality is preferable to size. Size, as before stated, may lead to trouble at lambing time.

In a desirable system of mixed farming a crop rotation should be followed, and the crops valuable in their relation to sheep are the following:—wheat, rape, lucerne, scarlet clover, tares, cowpeas, and maize. A choice from these may be made to suit the conditions of the farm. Care should be taken not to change the diet of sheep too quickly, or losses will result. They should receive considerable attention under such circumstances.

Rape, tares, lucerne, clover, and cowpeas are dangerous under certain conditions of temperature and moisture, as sheep may die from hoven or bloat, especially when turned upon them whilst empty. They should be full of grass before turning into paddocks for the first time. No matter what care is taken, some losses will occur. A little Stockholm tar placed in the mouth will reduce a bloated sheep if taken in time, and a spoonful of bi-carbonate of soda dissolved in half a pint of water and given as a drench, will also prove effective.

Many early sown wheats may be eaten off by sheep during the winter to advantage. If fed injudiciously, scouring may result. A drench of 1 oz. of raw linseed oil for a lamb, and 2 to 3 ounces for a grown sheep each day generally overcomes the difficulty.

Sheep should have access to a lick of salt, as it aids the assimilation of food, and has a salutary effect upon many parasites. A good lick is made up of 100 lb. Liverpool salt, 4 lb. sulphate of iron, and 5 lb. of lime. The iron is a good blood tonic. The lime may make good any deficiency of that material in the pastures and is often very beneficial to young growing sheep. Such a lick prevents that unnatural appetite in sheep which sometimes takes the form of eating dried poisoned rabbits and other decaying animal tissues. It should be covered from the rains. An excess of salt may interfere with nutrition by causing sheep to drink too much water, which may lead to a waste of the albumenoids of the feed.

Dipping.

The flock should be dipped about one month after shearing to destroy ticks or lice. Sheep suffering from these parasites cannot thrive; the wool is stained and frequently rubbed off on account of the itchiness induced.

It is claimed by most dip manufacturers that dipping improves the wool and prevents the attack of blow-flies. It is not wise to depend upon it for the latter purpose. Dipping should be carried out when the weather is settled. Rain shortly after dipping may, with most dips, cause serious scalding of the skin, thus interfering with the growth of wool. The instructions supplied with each dip should be carefully followed.

Foot-rot.

This disease, which is induced by too wet pastures, marshy country, &c., may be combated by allowing the sheep to walk through a bath of sulphate

of copper (bluestone) of the strength of 1 lb. to 2 gallons of water; when badly affected it should be of the strength of 1 lb. to 1 gallon. In bad cases they should pass through the bath once a week for several weeks, and after once a fortnight. The bath should be 16 feet long, 8 inches wide at bottom, 3 inches deep, with sloping sides. In purchasing sheep from country on which there is foot-rot they should be run through the bath of bluestone before turning into the paddocks. There are other remedies.

Worms.

Sheep may suffer from intestinal, lung, or stomach worms, which may extremely puzzle the novice. Fat lambs cannot be raised whilst these parasites are allowed to get hold of the flock. Preventive measures should be taken. Upon the farm the ploughing of the land destroys the eggs and germs of many parasites. A suitable lick must be available, as this is one of the best means of keeping such in check. Strict attention should be paid to any individual of the flock which is not thriving, and a timely drench may save trouble. All sheep dogs should be kept in good health, as many of their parasites are communicable to sheep, and affect them seriously.

Drenching.

A few simple drenches which are readily obtainable upon most farms are the following:—For stomach and intestinal worms, mix 15 pints of raw linseed oil and 1 pint of turpentine. A dose for grown sheep is from 2 to 3 ounces; for lambs half quantity. For lung worm, 1 pint of turpentine and 11 pints of milk are mixed thoroughly, of which 3 ounces is a dose.

There are many other remedies which should be dispensed by the professional man rather than by the average sheep farmer.

In drenching a sheep the head should be held in a natural position, as nearly horizontal as possible. The cheek is drawn away from the jaw, which forms a pouch, into which is poured the drench; if the drench is large, successive small quantities are poured, as the animal swallows. A sheep may be choked by rough handling and forcing it to swallow unnaturally. There is no risk when properly given.

Blow-flies.

During the last few years considerable losses have occurred among flocks from the maggots of the common blow-fly. The flies deposit the maggots upon the stained parts of the sheep; these under favourable weather conditions grow rapidly and eat into the flesh. The sheep thus affected singles out from the flock, and if not attended to soon dies. In the early stages the sheep will be seen to be uncomfortable, and works what is left of its tail vigorously. Considerable attention is required, especially during warm humid weather and after lambing. All stained wool should be cut away as soon as noticed. The practice of dagging and crutching the whole flock, especially before lambing, is a commendable one. The cutting off of the excess of wool around the udders may be helpful to the newly-born lambs.

When a sheep is blown the wool should be shorn from the affected part to allow the various applications to reach the maggots more freely. A strong solution of bluestone penetrates freely and destroys the maggots, and has proved effective. A dressing of fish oil five parts, oil of turpentine one part, and sulphur, will destroy the maggots and prevent the flies from again striking for some time.

There are several specifics in the form of fly powders sold for this purpose which are simple of application.

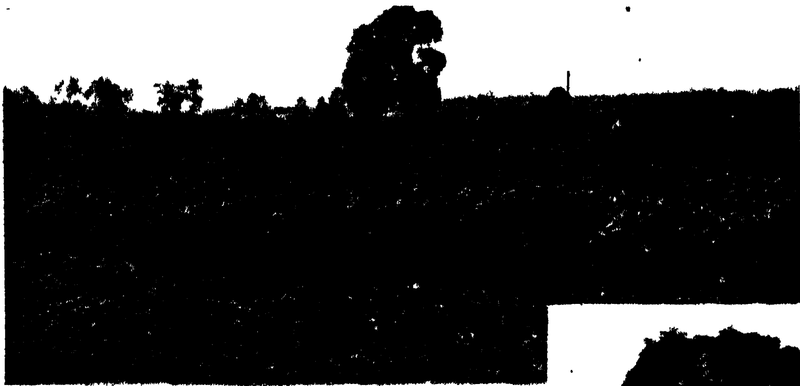


Fig 1.

Fig. 2.

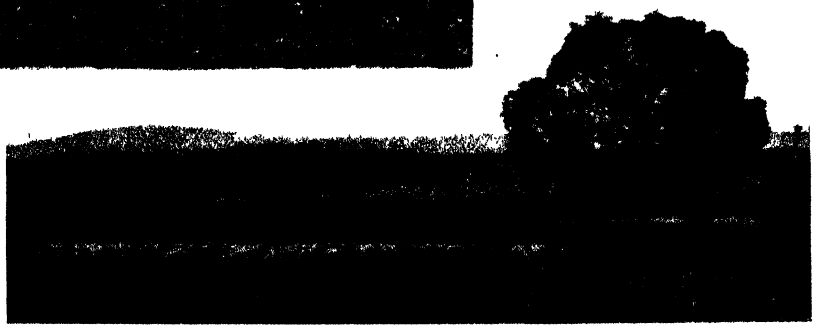


Fig 1. A crop of Rape, Bathurst Experimental Farm.
Fig. 2. Sheep depastured on Rape.

Common Errors.

A few common errors which the beginner should avoid are the following:—

The choice of unsuitable country.

The choice of unsuitable breeds.

Overstocking.

The purchase of mixed nondescript ewes.

The purchase of old ewes.

The use of cross-bred rams.

Placing too much dependence upon the natural pastures.

Failure to cull drastically.

An observance of the above principles would prevent many initial errors, and place the lamb and mutton trade upon a more stable basis, which would be to the advantage of the Farmer, the Pastoralist, and the State.

Irrigation.

W. J. ALLEN.

THIS is a subject which has claimed the attention of the Governments of different countries for a long time, and will, no doubt, continue to do so wherever the rainfall is such that it cannot be depended upon to furnish plant life with the necessary moisture during the growing season. The man on the land, more particularly in our dryer climates, as well as the man off the land, who can talk or write, are ever willing to give advice; even more ready, as a general rule, than the practical man; but it is refreshing to see such enthusiasm, which usually follows the reading of an article on what has been done by a successful irrigationist. And our enthusiastic friend concludes at once that, given land and water, all one has to do is to sow the seeds, plant fruit or other trees, turn on the water and attend to them until the crop is ready to harvest, and a handsome reward is a foregone conclusion. In many cases he may be right; but it

Fig. 1.—Victoria Avenue, Riverside, California, on either side of which are found some of the finest young orange groves in that settlement. This is a double drive, with ornamental trees planted down the centre, as well as on either side. The roadway on that side where the horse and trap are standing is oiled, and is in splendid condition for either driving or motoring. Orchards along this drive sell at from £150 to £400 per acre.

is not always that even the most sanguine and enthusiastic will make a success of either farming or fruit-growing under irrigation, unless he has had some practice. At the same time there are none who will succeed so well as the practical enthusiast, who, unlike the theorist, will not make any hard and fast rule as to how a certain work is to be carried out until he has tested same and obtained results. He is usually a man too, who is willing to hear the opinions of others on all subjects, though, perhaps, diffident in expressing his own, knowing how many things must be taken into consideration, which may work for or against any undertaking; therefore he does not like to take the responsibility of advising others, although he may be quite willing and competent to undertake and carry to a successful issue such an undertaking.

It is a well-known and recognised fact that in every walk in life some are competent to make a success of nearly everything they undertake, whilst others are as sure to fail; and so it is with fruit-growing and farming under irrigation. In this country a good many failures have been recorded, which, perhaps, a close investigation would disclose were only the result of misdirected energy, or that the soil chosen for the work was just the opposite to what it should have been; or it may have been that both soil and water were all that could be desired, but that the work was carried out without any system or knowledge of what was required to be done, or the proper time for doing the work. The man who goes on the land and who hopes to succeed should, first of all, be sure that the land

Fig. 2.—A Bird's-eye View of a portion of the Orange Orchards of Riverside, California, showing the foothills, and beyond, at a distance of twenty miles, the mountains.

he is securing is suitable for farming, fruit-growing, dairying, or gardening, as the case may be. He must then learn, if he does not already know, the proper time of the year to plant and to work the soil in order to

obtain the best results; and after all this, he must have sufficient ability to see that his products are marketed to the best advantage. It will take some little time to acquire all this knowledge; but is there any business upon which a man can embark which does not require experience and application and a fair amount of brains and ability. If there is, I can assure those who think of going on the land that this is not the least difficult of all undertakings, but quite the opposite, as there is nothing more difficult to thoroughly master than fruit-growing, farming, or dairying, and unless one is prepared to make a study of it, they had better save their time and money for some other profession.

To return to our subject, we find that best results from either farming or fruit-growing, &c., under irrigation, are obtained in the warmer climates where there is but a sparse rainfall, which, of itself, is not sufficient to supply the moisture required, and, therefore, success is only obtainable where the artificial application of water is practicable.

It is true we cannot at present point with pride to the results accruing from the few small ventures made in this State; but conditions here are different to those of other countries, and by going slowly they have had an opportunity of finding out which soils are the best for producing crops under irrigation—how the water affects the soil—that is whether there is anything in the water which is injurious to either soil or crops after years of continuous application.

In almost every instance where irrigation has been practised it has been found that the water taken from our large rivers during normal seasons is very suitable for use in growing crops, vegetables, or trees. It has been proved that the heavy are not so good as the loamy soils, notwithstanding the fact that the clay soils are usually much richer than the lighter ones. It has been found that lucerne does particularly well when there is plenty of limestone in the subsoil as well as a little alkali. Fruit-trees and vines thrive best in clayey and sandy loam where there is good natural drainage. If given good cultivation, sorghums will do well in the more heavy, rich, black soils. Vegetables will usually do best in the lighter soils. The man who has a good supply of water for his land can defy droughts, and the land can be made to yield crops every year, much heavier usually than non-irrigated crops—yielding sometimes three times as much as the latter. Unlike non-irrigated land, there should never be any failure of crops through lack of moisture.

Small holdings will support a family where now it takes very large holdings. This, in itself, means areas thickly populated, with the accruing advantages of good schools, churches, roads, &c. It means that fruit-growers, farmers, &c., can co-operate in the handling, packing, and marketing of their produce, thus reducing their expenses to a minimum.

During my recent trip through California I was brought face to face with what has been accomplished there in the development of water, and the prices obtainable for land with a water-right, and it made me pause and consider what a great future lies before this country if water can be put on our best lands at a reasonable cost. I will not go so far as to

say that because fruit and lucerne growing and farming have been so successfully carried on under irrigation there, that we can do as well here; but I do think there is a good opening here; and there is no reason why hundreds of families cannot make very comfortable livings by the intelligent application of water to our lands.

Fig. 3.—A Typical Fruit-grower's Home, as seen in many orchards throughout California.

Source of Water Supply.

Our main supplies would come from water conserved in dams, such as the proposed Barren Jack scheme, and from some of our larger rivers. Good water might also be pumped from wells where it is suitable for irrigation purposes; and where artesian water is available it might be used for growing fodder crops where the water and soil are suitable. I am inclined to think that there are many artesian wells which are only throwing small supplies at present, but which, by assisting Nature with a pump, could be made to deliver large heads. In California, where crude oil is cheap, and where at present it is used for fuel by nearly all the railways and all other places where power is required, there are hundreds of large pumps at work lifting water from wells, either by pumping it or forcing it out by air-pressure. The latter process is used chiefly where the wells are shallow. The largest plant I saw there was one erected by Mr. George Chaffey, and the water so raised flowed from the several wells into a large covered cement drain, and was used for irrigation purposes in the Whittier district, where oranges, lemons, and other fruits and walnuts are produced in large quantities.

Wherever it is possible to procure the water from its source by gravitation it is preferable to do so, as the expense of the up-keep of a pumping plant is always a heavy one. Unfortunately, much of our land suitable for irrigation purposes lying along the banks of the Murray, Murrumbidgee, Lachlan, and Darling Rivers is many feet above the river level,

and in many instances the only practical way of placing it under water would be to lift the water with pumps, just as it is at Mildura where irrigation has been and is being carried out with such marked success. There are large areas of such land which, in time, must come into cultivation as soon as water is placed on it. The expenditure of large sums of money required to do the work must, to a certain extent, be governed by the demand for such lands, and the sooner our population increases the sooner will such lands be sought after. At present it is not so much the supply but the demand which is lacking. Had our climate been a little more uncertain than it is we would have had more champions of irrigation and much larger areas under water; but there has always been a feeling that, given the average rainfall, there would be sufficient moisture for the wheat as well as for grass; and our pastoralists have become accustomed to relying on rain rather than irrigation.

In our back country there are large areas, water for irrigating which can never be made available. In such places the best the pastoralist can do is to put down large tanks and keep them in good order, and, where possible, put down wells, if it has been proved that the water is suitable for stock to drink.

Water can be had by sinking wells in most of our drier country, but in many cases it is so brackish that stock will not drink it. It has been found that such water is not fit for irrigation purposes as it destroys rather than assists plant life.

In choosing soils for general use the medium loamy soils would be about the best, that is if one could strike the happy medium between a clay loam and a sandy loam. A clay loam contains from 25 to 40 per cent. of sand, and a sandy loam is from 60 to 70 per cent. sand, whilst a light sandy soil contains from 75 to 90 per cent. of sand. Such soil will grow good crops, but will require continuous feeding in order to make them produce profitable ones.

Clay soils are rich in potash. Red clay soils, as seen in many of our wheat-growing districts, contain iron. Humus is the portion of the soil resulting from decayed vegetable matter. Clay soils when well supplied with humus are friable; but when the soil is deficient in humus it sets hard and has an impoverished appearance. One of our principal reasons therefore for growing green crops for turning under is to furnish the soil with humus. In our departmental orchards we grow crops of peas and black tares which supply humus rich in nitrogen as well as other compounds requisite for plant food.

I observed in my visit to California that the methods of applying water were, so far as I could see, precisely those in vogue during my residence there some years back. The furrow system is that most generally used, still I saw some orchards on the lighter soils irrigated by the basin system. The water is turned into the basins until they are full; when the one is filled the opening into it is closed and the water turned into another, and so on. In light soils the water soon disappears,

and the land, whether it be light or heavy, receives a thorough cultivation as soon as it becomes dry enough to work.

As before stated, however, the furrow system is that used in nearly all of the orchards, and gives general satisfaction. From two to eight furrows are run between each row of trees, according to age, the older the trees the more water they require. The water is then allowed to run until the soil is soaked up to a good depth.

Cement pipes, cement drains, redwood fluming, and earthen channels are all in use for conveying the water to the place of its application from the main or lateral channel. Cement pipes are coming into use in many of the orchards in Riverside, Whittier, Ontario, and other places. These

Fig. 4.—An orange orchard in Ontario, California, in course of irrigation.

are of different sizes according to the quantity of water they are required to carry, and are laid underneath the ground along the highest elevation of the orchard. Opposite each vacant space between the rows of trees is a stand-pipe also made of cement, and in this is fixed from two to eight slides, which are opened just wide enough to allow a sufficient flow of water to escape to keep wet from one end to the other the furrow which it has to feed. The water is allowed to flow long enough to thoroughly saturate the ground to a depth of at least 2 to 3 feet. Such a wetting should be sufficient to keep an orchard in good growing condition for from four to seven weeks in the hottest part of the year. The number of irrigations required depends largely on the soils, some of which retain moisture much longer than others. Also, a well-cultivated soil will hold the moisture much longer than one which is indifferently worked.

The two styles of stand-pipes are shown in Figs. 6 and 7. Fig. 8 shows two cement distributing channels, commonly known as head channels; the dividing line of the two blocks lies between them. They are so situated that the orchards on either side can be watered from them. The same kind of a slide (see Fig. 9) is fixed in this as in the stand-pipes, and the water is turned on or off in precisely the same way, except that small cleats 3 inches wide are placed in the channel, which raise the water sufficiently high to force it out and into the furrows made to receive it. It can be seen that the channels run down a fairly steep slope. These slopes have the furrows drawn in such a way as to give a fall of not more than from 2 to 6 inches to a chain. Such a fall will not wash away the soil as it does where water is run down too steep a gradient. At no time is more

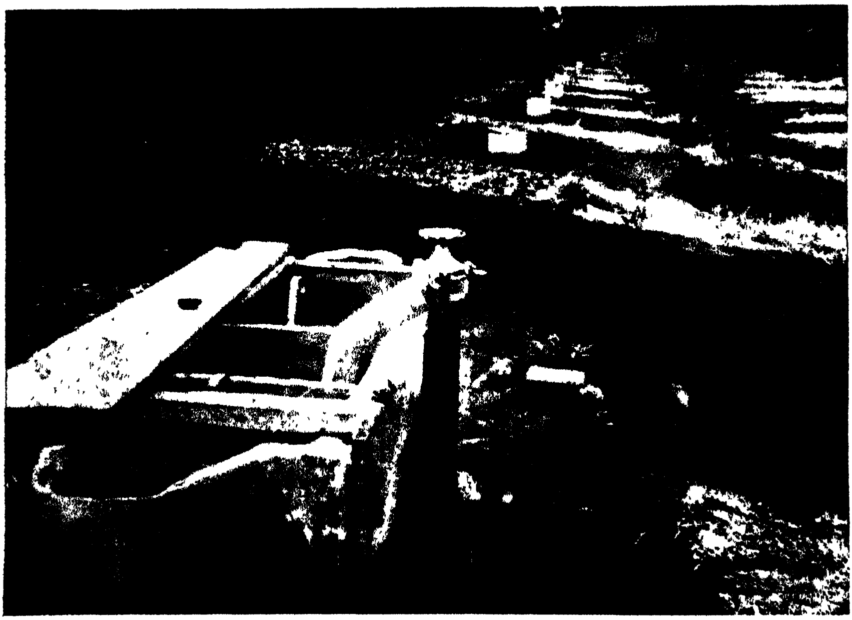


Fig. 5.—The box in the foreground is a Cement Receiving and Measuring Box, through which the water has to pass before entering the cement pipe-line for distribution into the different furrows. The pipes seen at intervals are the same as described in Fig. 6, from which can be seen running four streams of water.

water turned into any one furrow than just sufficient to keep it wet from one end to the other, and none is allowed to go to waste. During the four hottest months, water in some parts of California costs up to 2s. 3d. an inch, running twenty-four hours, and it takes about 50 inches two whole days to thoroughly saturate a 10-acre orchard.

It may be as well to explain now about how many gallons there are to an inch. A miner's inch of water is equal to 9 American gallons* of

* The American gallon is less than the Imperial, there being 1·2 U.S. gallons in one Imperial gallon.

water per minute, and a 50-inch stream running continuously for two days would deliver 648,000 gallons per day, or 1,296,000 gallons of water on the 10 acres; and allowing 27,144 gallons to cover the land an inch deep, it would give each acre just a fraction over 4¾ inches per acre for the one watering, or 129,600 American gallons per acre at a watering. This will give those who are not accustomed to irrigation a fair idea as to the quantity of water required to keep a bearing orchard in a good healthy condition.

In giving the above figures I am only speaking of the water actually delivered on the land to be irrigated. There is more water required to be

Fig. 6.—A Circular Cement Pipe, projecting above ground, which is used for distributing the water into the different furrows running between the trees or vines. Redlands, California.

turned in at the point where the supply is taken from, as there is a certain loss from seepage and evaporation. Where water is delivered in pipes for any purpose, it is as well to know that doubling the diameter of the pipes increases their capacity four times.

I have seen many beginners irrigating their trees, vines, and plants of different sorts, and in numberless instances the water was shut off before it had soaked into the roots of the young plants. At times they showed a willingness to explain to me how it was done, but in most cases they wished to know how it was done, and when the young plants had had sufficient water. It is never advisable to flood the ground around trees

or plants, but the furrows should be not further than 1 to 3 feet from the tree, vine, or plant, and the water should be allowed to run until it has reached the roots of the plant and moistened the soil around them.

Flooding trees or vines should be avoided as it often causes gumming and other diseases.

Newly-planted trees require water more often than established ones, so that a light irrigation at frequent intervals is about the best course to adopt in the case of starting a new orchard; and always remember that the less the roots of a young tree are exposed to wind or sun at time of planting the better are its chances of growing.

Whilst in California I visited all of the principal centres where both citrus and deciduous fruits were grown, and it was pleasing to note the

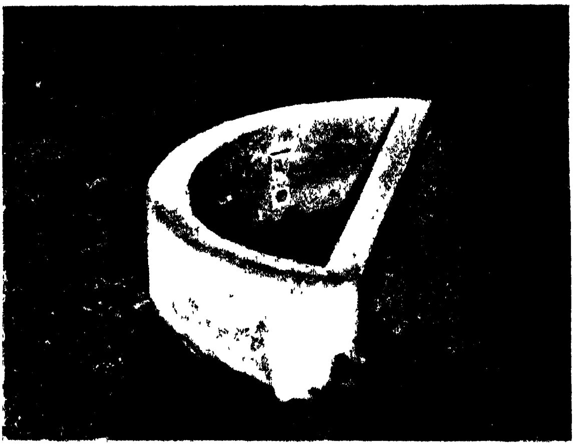


Fig. 7.—A Semicircular Cement Distributing Box, placed close to the boundary of an orchard, directly over the cement pipe-line. From this box, from six to eight streams of water may be run, and there is one of these boxes placed between each two rows of trees.

great care which was bestowed on the up-keep of the majority of the orchards. The cultivation was perfect; that is, the soil was kept constantly stirred up to a good depth. Manuring was receiving the attention of all the fruit-growers, and experiments carried out to ascertain which manures gave the best results, whether commercial or stable; and I noticed that those growers who could get it always used the stable in preference to the commercial manures, from which I deduced my own inference, which is in keeping with our experience in this State.

In the citrus orchards cowpeas, gray field-peas, and black tares were grown among the trees as crops for turning under in order to supply humus, and most of the seed was treated before being sown, and the seed sown amongst the trees either the last month of summer or the early fall,

just after the trees had received a thorough irrigation. The cowpeas were, of course, sown much earlier than the peas or tares, as they would be ploughed under late in the fall about the time the frosts commenced, while the peas and tares would be turned under early in the spring.

In this country, where but few orchards can be irrigated, we could not grow cowpeas in the orchard, as during most of our summer it is quite hard enough to keep a sufficient supply of moisture in the soil for the trees alone, without having a crop of cowpeas pumping out the moisture as well. I would like to see a lot of our growers take more interest in the cultivation of their orchards as well as in the manuring of them, as

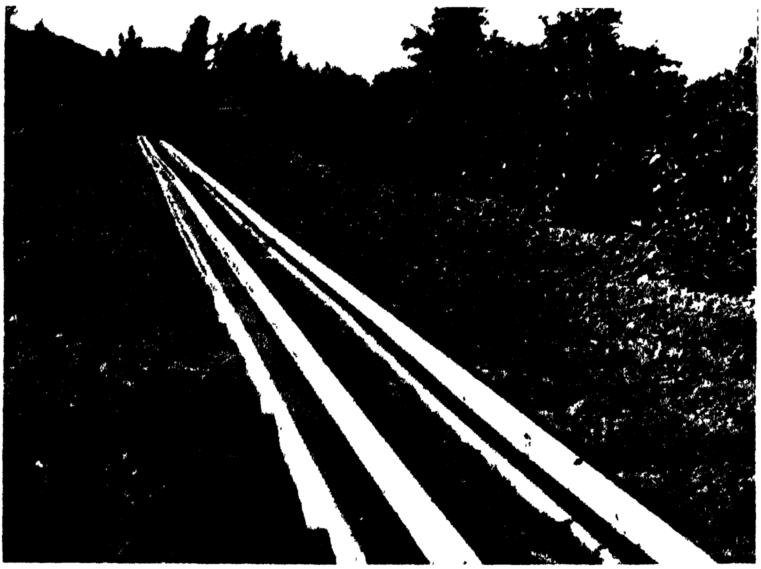


Fig. 8.—Two Cement Distributing Channels for watering the orchards lying on either side. The boundary line which divides the blocks is midway between the channels. There are very few fences to be found around orchards or dwelling-houses throughout the fruit-growing districts of California.

I am sure there are many orchards which have ceased from yielding paying crops simply because they have been starved.

Whilst in Ontario (California), Etiwanda, and Los Angeles I had inquiries as to what Australia was doing in the way of irrigation. Their interest was chiefly centred in Mildura and Renmark, as the Chaffey Brothers, who so successfully pioneered Ontario and Etiwanda, and more recently the Imperial Valley, were the founders of these two settlements. For fertility, productiveness (and some time even in population), Imperial Valley bids fair to rival the great Delta of the Nile in Egypt, to which it has many points of resemblance. It is a marvellous region, with a half-

dozen flourishing towns, and some hundred-thousand acres under cultivation therein. It is only six years since Mr. George Chaffey undertook and constructed a 70-mile channel to carry water from the Colorado River to a desolate, uninhabited, and uninhabitable desert, and called it Imperial Valley. It was the most conspicuous and most daring irrigation enterprise in all America. Since then, however, there have been other projects of equal magnitude, undertaken however by the Government itself.

The Ontario colony possesses a greater interest to Australians because the Chaffeys came direct from there to their Mildura and Renmark undertakings in this country. There are two incorporated towns in this

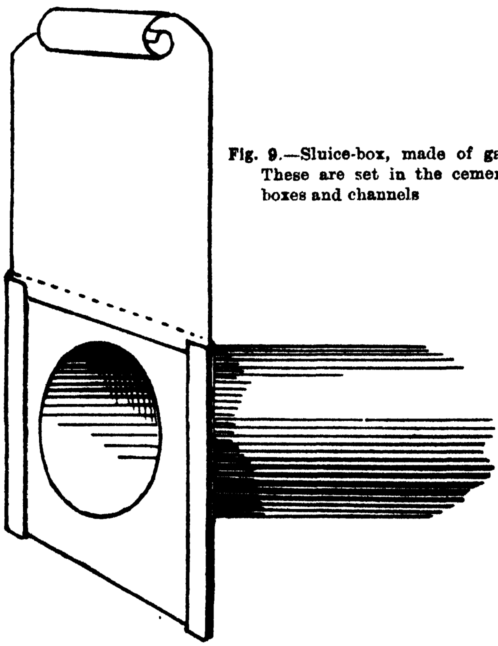


Fig. 9.—Sluice-box, made of galvanised iron. These are set in the cement distributing boxes and channels

colony now, with fine banks and fruit exchanges, which receive and pay to the growers £280,000 annually for the citrus fruits grown in that colony, as well as £50,000, the output of the canneries and drying yards this year.

I found the greatest interest manifested in the Mildura and Renmark settlements, and was pleased to be able to assure inquirers that irrigation and horticulture there had long since passed the experimental stage, and that both places are now in a flourishing condition, and upon a substantial basis, thanks to the far-seeing energy of the promoters as pioneers and educators in irrigation matters many years ago.

With the object-lessons we have in Victoria and other countries we should be able, in entering upon any large scheme, to avoid many of the mistakes which have been made; and if irrigation does half as much for us as it has done for others, the sooner some move is made in the matter the sooner will we derive benefit therefrom.

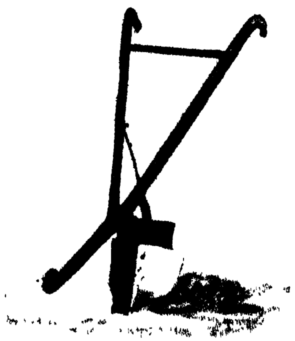


Fig. 10.—A Single Furrow Implement. This consists of a light beam and handles, to which is attached a single shovel-tine (a kind of light dowel mould-board)—these, as purchased, are not quite deep enough, so a strip of sheet-iron is added. Used for running single irrigating furrows in vineyards and orchards.

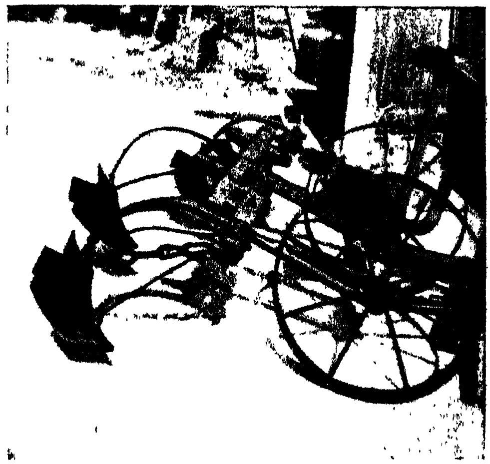


Fig. 11.—Two-horse Orchard Cultivator, adapted to run three irrigating furrows at a time. The ordinary tines have been removed and three shovel-tines fixed in their stead; these also have additional strips of sheet-iron added, as in the single-furrow implement.

We may have obstacles to overcome, and no doubt will have, in starting any large scheme, but if we lay a good foundation and work with a will we will soon be able to defy such difficulties, which will make success doubly sweet.

Coarse Salt that has been used for curing Hides as a Manure.

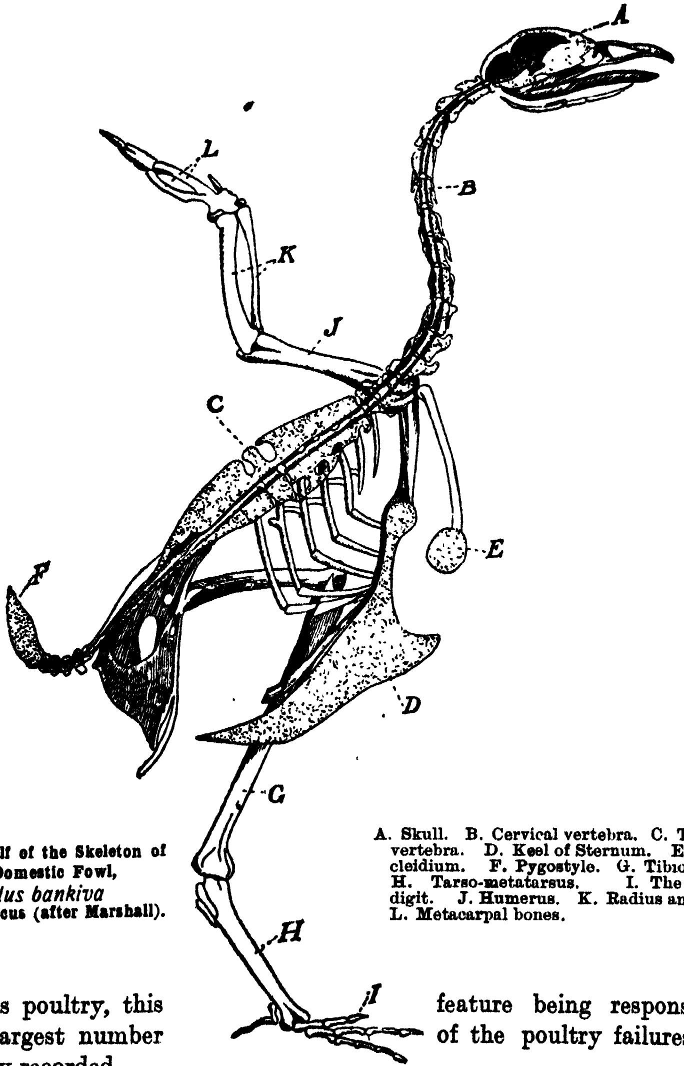
Salt has practically no manurial value, though it is often used on sandy loams and light soils in Europe, at the rate of 2 to 3 cwt. per acre, for wheat. It is found to stiffen the straw, but does not increase the harvest. The salt that has been used for curing hides would, probably, contain organic matter which would have a beneficial effect on the soil, but it would be worth very little as a manure, and should not be used at a rate exceeding about 4 cwt. per acre, or it may be actually harmful.—F. B. Guthrie.

Diseases of Fowls.

G. BRADSHAW.

Introduction.

In the whole catalogue of not only farm stock, but domesticated animals of every sort, none present the difficulties in rearing through proneness to disease as poultry, this feature being responsible for the largest number of the poultry failures so frequently recorded.



The Left Half of the Skeleton of the Domestic Fowl,
Gallus bankiva
var. domesticus (after Marshall).

A. Skull. B. Cervical vertebra. C. Thoracic vertebra. D. Keel of Sternum. E. Hypocleidium. F. Pygostyle. G. Tibio-tarsus. H. Tarso-metatarsus. I. The second digit. J. Humerus. K. Radius and Ulna. L. Metacarpal bones.

Nor has what is known as modern methods of management done much to reduce the abnormal losses which annually occur. Rather than this, some of the best informed English and American authorities declare that despite the multitudes of sure cures which regularly appear, the most remarkable feature of modern poultry-keeping is the great development of diseases in various forms. Another feature is the fact that every poultry-keeper experiences this handicap to success. One farm may be perfectly free from disease for two or three years, but it invariably appears in some form. If a simple disease it is frequently easily combated, but when cholera or diphtheric roup gets into a flock, farewell to any profits until such has been overcome. It is always granted that prevention is better than cure, and certain it is that good management, sanitary conditions, and healthy stock are the best safeguards against disease; at the same time the well-regulated poultry-yards experience trouble at some time, but are usually those of a hereditary nature.

The first consideration in the way of prevention is to secure healthy birds to breed from, for fowls transmit their weakness more readily than any other stock. Any taint of disease in an apparently cured specimen, or latent disease, frequently appearing in the offspring.

Next to healthy stock, dry, well-ventilated, but not draughty houses should be provided. Plain feeding, with the usual farm cereals, and their meals and by-products, a little meat, green stuff, grit, pure water, fresh runs, and sufficient exercise, complete the essentials for health. They are, however, no guarantee for such, and that disease is liable to appear in the best regulated flocks is now so generally acknowledged, that hospital quarters are provided in every modern poultry establishment. With all this a large percentage of chickens and adults die. Some of the fatalities no doubt are preventable, and to the end of minimising the great annual mortality is the object of this and following exhaustive papers.

CHAPTER I.

Glossary.

To go thoroughly into the cause and treatment of the three divisions of disease—respiratory, digestive, and zymotic—medical and other terms will have to be employed, which to some of the ordinary poultry-men may not be too well understood; hence to remove any cause for a charge of ambiguity on this point, the following glossary is supplied:—

Acute.—A disease coming on suddenly.

Alteratives.—Drugs to improve the general nutrition of the body; such as cod-liver oil, Parrish's food, malt extract, &c.

Albuminoid Ratio.—The proportion between the nitrogenous substance and the non-nitrogenous found in a food.

Alimentary Canal.—The tube down which the food passes during digestion.

Allantois.—A membrane formed during the development of the chick. It is a respiratory organ, and by means of it the chick breathes.

Anæmia.—Signifying a poverty of blood. The mouth, tongue, and comb abnormally white. Limbs cold and muscular prostration.

Anodynes.—Medicines which allay pain, such as cholorodyne, laudanum, sweet spirits of nitre, morphia, &c.

Anatomy.—To separate the parts of a body so as to make out their position and structure.

Apoplexy.—Sudden insensibility, arising from cerebral pressure.

Antacids.—Medicines used to correct acidity in cases of indigestions, or to neutralise acid poisons. Lime water, baking soda, and powdered chalk are instances.

Ascites.—Abdominal dropsy. The abdomen is greatly enlarged and pendulous. Locally termed " down behind."

Astringent.—Medicines used to arrest discharge from the eyes, bowels, or other organs. Eucalyptus gum, powdered bluestone, potash alum being instances.

Biology.—The science which tries to answer questions about all life.

Bronchitis.—Inflammation of the mucous membrane of the bronchial tubes.

Blastoderm.—The germinal skin or layer from which the embryo is developed.

Bumble-foot.—A thickened growth of cuticle on sole of foot.

Caustics.—Substances which have the power of destroying living tissues, such as warts, tumors, &c. Acetic acid, oil of vitriol, and lunar caustic are examples.

Coagulation.—To change from a liquid to a thickened curd-like state.

Catarrh.—A febrile or inflammatory condition of the mucous membrane. When confined to eyes and nostrils it is known as " cold in the head."

Cholera.—Epidemic diarrhœa.

Consumption.—To waste away, known in fowls as " going light."

Cloacitis.—Vent gleet. Heat and redness about the vent.

Cramp.—A spasmodic contraction of the muscles of the limbs. Common in young chickens.

Crop, Dropsy of.—In young birds usually due to anæmia.

Crop, Impaction of.—Full and solid feel of the organ, with loss of appetite and dullness.

Debility.—Feebleness. Going light.

Diarrhœa. — Frequent evacuation of a watery nature.

Development.—A term which is used to express the changes which take place in animal and vegetable life.

Digestion.—The changes which the food undergoes in passing through the alimentary canal.

Diphtheria.—A discharge of sanious liquid from the eyes and nostrils, and sticky material from the corners of the mouth. This secretion becomes thick and offensive as the disease proceeds.

Dissection.—To separate the various parts, so they can be better seen.

Embryo.—The young bird in the egg.

Egg-bound.—Visiting the nest without result. Head carried unusually erect, tail and wings drooped. Restlessness and distress.

Excretion.—The separation from the blood of waste substances by special organs.

Enteritis.-Rapid prostration, sufferer squats down, ruffled plumage, drooped wings, abdominal heat, and great thirst.

Feather Eating.—A habit contracted by fowls in confinement, from want of vegetables, grit, or occupation.

Ferment.—A substance which can act on another substance, and change its character.

Gallus.—A genus of birds to which the domestic fowl belongs.

Gapes.—An ailment due to small threadlike worms in the windpipe.

Gland.—An organ which secretes some substance from the blood.

Gout.—The symptoms of which in poultry are swollen and heated condition of feet, arising from congested blood vessels.

Indigestion.—Difficult to digest. The symptoms in fowls are protrusion of head, arching and extending neck. Fulness and distension.

Liver, Atrophy of.—The symptoms are depression and drowsiness.

Liver, Congestion of.—Irregular and impaired appetite.

Liver, Inflammation of.—Great depression, bilious diarrhœa, rapid emaciation, thirst, and loss of appetite.

Mucous Membrane.—The membrane lining the cavities of the body.

Metritis.—Inflammation of the oviduct or egg passage.

Offal.—The waste materials which have to be thrown away when the fowl is prepared for table.

Omentum.—A mass of fat found near the posterior end of the body of a fowl.

Ova.—The cell from which the egg is produced.

Ovary.—The organ in which the eggs are produced.

Oviduct.—The tube down which the egg passes from the ovary.

Pectorial.—The breast. The pectorial girdle is the set of bones which support the wings.

Peritonitis.—Inflammation of the membrane which lines the abdomen and invests the viscera.

Purgatives.—Medicines which cause the emptying of the bowels. When they act mildly they are spoken of as aperients. Castor oil, calomel, Epsom salts, and jalap are examples.

Pip.—A hard horny condition of the tip of the tongue.

Pneumonia.—Inflammation of the lungs.

Peritoneum.—The lining membrane of the body of the fowl.

Proteid.—A food substance which contains carbon, hydrogen, oxygen, nitrogen, and sulphur.

Rheumatism.—Enlarged, hot, and painful joints. Birds move with difficulty.

Roup.—A well-known disease, with an offensive discharge from the eyes and nostrils.

Rasores.—An order of birds to which the domestic fowl belongs, characterised by the toes terminating in strong claws for scratching.

Scabies.—An affection due to the presence of a parasite.

Skeleton.—The hard firm pieces which constitute the frame work of the body.

Stimulants.—Agents which excite the vital powers and increase the frequency and force of the heart's beat. Carbonate of ammonia, spirits of wine, whisky, &c., are examples.

Scaly Legs.—Heavy dry scales on the legs.

Tonic.—Medicines which impart firmness, vigour, and tone to the body when it is weakened. They are stimulants to a certain extent, as they quicken the vital power, but the result is brought about gradually. The chief examples are quinine, quassia, gentian, nux vomica, &c.

Tuberculosis.—A disease affecting the tissues.

Vertigo.—To turn round. The fowl runs about in a circle, sometimes with head elevated, and inclined to one side.

Vermifuge and Vermicides. — These are drugs which are capable of expelling or destroying worms within the stomach and intestines. Santonine and areca nut are prominent examples.

Vertebra.—Backbone of the fowl.

Viscera.—The contents of the great cavities of the body.

Wattle, Dropsy of.—The symptoms are a distended condition of wattles, which through pressure are discoloured.

Zymotic.—Infectious disease produced by some morbific principal, acting on the system like a ferment.

Chapter II.

Roup.

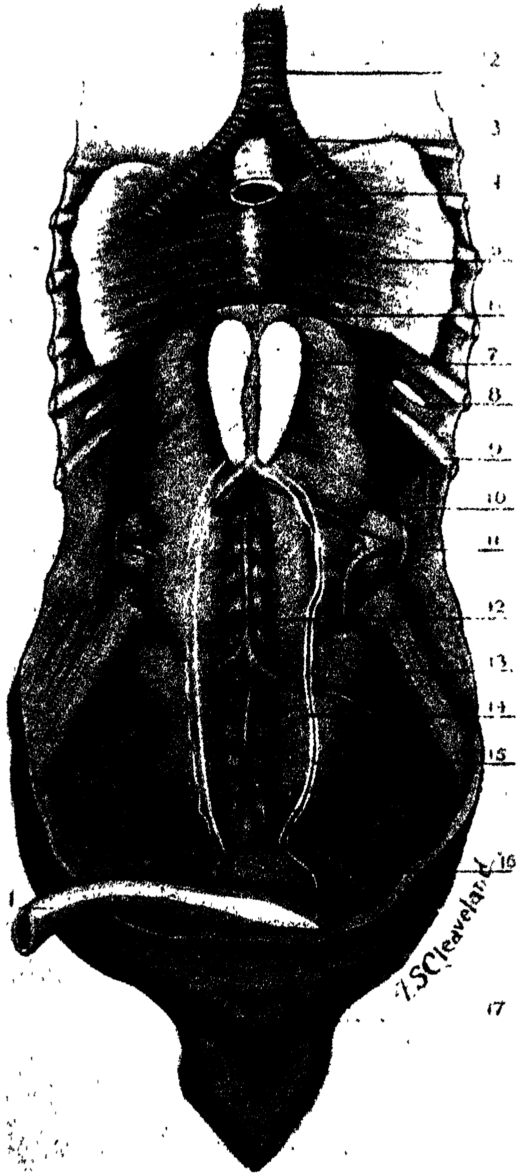
It would be a difficult task to tell how many books have been written on poultry diseases, or to enumerate the many pills and potions which appear with due regularity, guaranteed to cure, and thus assist the poultry-keeper in preventing the serious losses which result from the very many complaints to which poultry are subject.

The principal cause of a number of diseases is over-crowding, ill-ventilated houses, and what is known as fowl-sick runs. The bulk of diseases arise from some of the above causes, while a few are hereditary.

Of the many arising from insanitary conditions, some become contagious—that is, spreading by contact; while others are contagious, infectious, and epidemic, and the one of all others to be dreaded is that which partakes of the above three qualities, and is termed roup, which, next to cholera, is the most dangerous of all poultry diseases, and is responsible for more deaths in poultry of every age than all other maladies combined. Roup may be called a disease of the air passages.

The first cause may be neglected cold, roosting in draughty houses, drinking foul water, or dirty runs, while the introduction of a bird from another yard may be responsible for the trouble, and by this means a whole flock have been known to become affected. The disease, however, attacks fowls in many ways, but most frequently commences by a cold, and is noticed by a thin watery discharge from the nostrils. If not taken in time, this discharge thickens and acquires an offensive smell The

nasal passages then become clogged, thus affecting the birds' breathing, and it then begins to cough and sneeze, and following this there may be



View of Organs lying along the Back of Fowl.

1. Rectum. 2. Trachea. 3. Bronchus. 4. Œsophagus. 5. Lung. 6. Suprarenal capsules. 7. Testicle. 8. Cut for caponising. 9. Rib. 10. Kidney. 11. Nerves and blood vessels which pass through to supply the legs. 12. Blood vessels along the spine. 13. Kidney. 14. Ureter. 15. Vas Deferens. 16. Bursa of Fabricius. 17. Verge of Anus.

a rattling in the throat, caused by breathing through the blocked windpipe and nostrils. The face and eyes then become swollen, and matter collects under the skin. The mouth becomes reddened, and the mucous membrane inflamed. After this there is a most offensive deposit of a cheesy nature, of a tough consistence and firmly adhering. This deposit becomes thick and yellow in colour, and the bird is obliged to breathe through an open beak, and the swallowing of food is difficult.

The following is a brief description of the disease by a prominent English authority, Mr. E. Brown, F.L.Z. :—" Roup is really a combination of diseases, as it embraces a cold in the head and derangement of the digestive system, or, as is more often the case, scrofula in the system. In many instances the scrofula or stomach derangement has been previously quiescent, but cold having been induced by a sudden change in the weather, or from exposure, disease is developed and takes the form of roup. Externally there are all the symptoms as in common cold, namely, running at the nostrils, sneezing, or cough, and in many cases a puffing up or swelling around the eyes, in the worst forms there being a cheesy substance below the eyelid, sometimes entirely covering up the eye. In yet other instances there is nothing but running at the nostrils to indicate the presence of roup, and heavy mopy appearance of the fowl. But it is very easy to distinguish between common cold and roup, for in the latter case the mucous is thickened, and, together with the breath, is very offensive."

J. Woodroffe Hill, F.R.C.V.S., in " The Diseases of Poultry," says :—" Roup, primarily, is neither more nor less than severe catarrh, and when the rattling in the throat occurs it is due to the nasal obstruction and the passage of expired air through the collected mucous. Frequently roup assumes a malignant type, and becomes diphtheritic, and, under such circumstances, is very fatal.

" *Causes.*—Damp, cold, insufficient ventilation, contagion.

" *Symptoms.*—A sticky discharge from the eyes and nostrils, difficult breathing, feverishness, and depression. As the disease progresses, all the symptoms increase in severity; the discharge thickens, becomes offensive, and collects in cheesy masses, blocking up the eyes and nostrils. The breathing is laboured, emaciation is rapid. The bird is nearly choked by the accumulation of thick roupy matter in the throat, and in many cases dies from suffocation.

" *Treatment.*—This must be in accordance with the condition of the patient. No hard and fast line can be laid down, and, therefore, specifics as advertised frequently fail to accomplish the cure they are said to do. In the early stage of roup, benefit will be derived from holding the patient's head over steam impregnated with acetic or carbolic oil; the eyes and nostrils should be frequently cleansed with a little weak alum water. Medicinally, a teaspoonful of port wine, with a grain of quinine, may be given twice a day with advantage, or ten drops of sal volatile in a teaspoonful of water. The food should consist of warm bread and

milk, slightly seasoned with pepper or mustard, administered by hand, if the fowl refuses to eat. Warmth and a pure atmosphere are also essential. In advanced cases the collected matter should be continually removed, especially that within the throat and nostrils; the latter may be syringed with a weak solution of chloride of zinc, and the eyes sponged with the same. At this stage, the following mixture is advisable:—Five grains each of sulphate of iron and ginger in a teaspoonful of linseed tea twice a day. The throat, particularly if diphtheritic, should be painted with a weak solution of nitrate of silver (5 grains to the ounce), or carbolic acid (one to forty). Roupy birds should be completely isolated and the house disinfected."

In view of the fact that roup in Australia is as prevalent as in other countries, and is as destructive, too, the following bulletin, issued by the Ontario Agricultural College, should be valuable to our poultry men here. The conclusions are the results of exhaustive experiments at the above college, and have since been confirmed in other quarters. Many drugs and various methods of treatment were employed through the experiment, nearly all of which were valueless, the patients in most instances dying; the successful treatment being that recorded below. The experimentalists were Professor F. C. Harrison and Dr. H. Streit, Bacteriological Department of the Ontario Agricultural College and Experimental Farm, Canada:—

"The most widely-spread and destructive disease affecting the domestic fowls is known as Roup, Canker, or Distemper. By some the disease is called cancer of the throat, mouth, &c., or even by the name of fowl diphtheria; but all these different names are given to the same disease, according as some particular symptom is more or less prominent.

"*Economic Importance.*—The economic importance of this disease is very great, and it is probably one of the greatest hindrances in the poultry business. The direct losses from the disease vary greatly in different epidemics. Thus, in a virulent outbreak, there may be many deaths in a short time; while, in another, a flock may become infected and only a few birds die. Of much greater importance are the indirect losses; and these are apt to be overlooked by farmers or those who keep only a few fowls and pay but little attention to them. The diseased birds recover very slowly; and they remain thin, anæmic, and unfit for egg production, fattening, or breeding—eating just as much as if they were normal and living at the expense of their keeper.

"*General condition of Roupy Birds.*—The general condition of roupy birds varies very much. After the first symptom of the disease, which is usually a putrid catarrh from the nostrils, the affected fowl is generally restless, separates from other members of the flock, becomes dull, cowers in the corner of the coop, or mopes in the corner of the pen, with its head drawn close to its body and often covered with its wings. If there is a severe discharge from the nostrils or eyes, then the feathers upon the wings or back are likely to be smeared with it, stick together, and after

some time fall out; and the eyes are often shut, the lids being glued together by the sticky discharge from them. A fowl in a sleepy condition, or moping as described, frequently rouses itself for a time, takes food, and especially water, and then gradually returns to the apathetic condition. Many fowls having the disease in a chronic form keep their normal appetite for a long time, and seem very little disturbed physically, whilst others, especially when the face or eyes become swollen, lose their appetite, grow thinner and thinner, and finally become too weak to stand or walk around, when they lie down and die in a few days. During the last stage, diarrhœa, with offensive yellow or green discharge, often sets in and causes death in a short time. Many poultry-keepers assert that roupy birds show fever; and it is certain that the head is very often hot, but the body temperature is normal, or only very slightly higher than normal.

"*Special symptoms of Roup.*—By the term 'Roup' we generally understand a more or less putrid discharge from the nostrils, which lasts for weeks, or even months. The disease often follows a common cold, to which fowls, especially young fowls and those of the more delicate breeds, are much predisposed. In the first stages of roup, the birds often cough or sneeze, and the breathing is noisy, caused by the partial closing of the air passages, which become blocked with the discharge from the nostrils. When the air passages are entirely closed by the discharged products, the fowl has to open its beak in order to breathe. Sometimes a yellowish cheese-like mass forms in the nostrils, growing quickly and pressing the upper walls of the nose upwards, and if this mass is removed, an uneven bleeding surface is left, which forms a new cheesy mass in from twenty-four to forty-eight hours. Whilst many roupy birds show only the above-mentioned symptoms, others become more seriously diseased. The face of roupy birds is very often swollen, especially between the eyes and the nostrils; and this swelling, which is hot and sore, sometimes grows into a tumour as large as a walunt—generally firm and hard. A bird in this condition is frequently found scratching at the tumour with its claws or wings, as if endeavouring to remove it. If the tumour grows on the inner side, towards the nasal passage, it forces the roof of the mouth downward, and the upper and lower beak are slowly pressed out of their normal position, so that the bird cannot close its mouth. On making an incision into the tumour, we find a solid, cheesy, yellowish matter, which may be pulled out like the root of a plant; but it usually has to be broken into small pieces in order to get it out. Around this mass, there is a more or less smooth, grey or brownish membrane that is capable of again forming a cheesy mass similar to what has been removed. The mass itself, when not attended to, often grows into the nasal canals, and blocks them up completely. Generally, combined with the formation of the tumou on the face, there is an affection of the eyes; or the eyes become diseased without the preliminary discharge from the nose, in which case poultry-keepers speak of fowls as suffering from 'Roup of the Eyes.'

"*Roup of the Eyes.*—The first symptom of the eyes is generally an inflammation of the eyelids. These become red, swollen, and hot; then the mucous membrane and glands of eyes become inflamed and begin to secrete a liquid—at first clear, and then of a grey, slimy, putrid character. Occasionally the mucous membrane of the eye socket is the primary seat of the infection of the eye, and the eyelids swell as a secondary symptom. It is easy to understand that the eyes may become infected from the nasal cavity, as the eye socket has free connection, by means of the lachrymal canal, with the nasal cavity, and thus the diseased products from the nostrils can pass into the eye sockets. The secretion from the eyes is similar to that described as coming from the nostrils, *i.e.*, at first a clear liquid, then changing to a putrid, grey, and offensive discharge, which dries on the feathers at the side of the head, causing them to stick together or fall out. If the secretion is retained in the eye socket, it undergoes a change, becoming a yellowish, solid, cheesy mass of the same appearance as that found in the nasal tumour. This cheesy mass either forces the eye out of its socket, or the inflammation entirely destroys it. These cheese-like masses form in one or two days, and may reappear after many daily removals. All these affections, described above, may be localised on one side; but often both nasal passages and both eyes are affected at the same time. Combined with the symptoms of roup above described, there often are patches of a greyish-yellow exudation firmly adherent to the mouth, throat, &c. These patches are called "false membranes"; and, on account of their somewhat close resemblance to the membrane which is formed in human diphtheria, it has been thought by some writers that the avian and human diseases are the same. Here, however, let it suffice to say that the weight of evidence is against this contention. We may also point out that many poultry-keepers who notice the false membrane on the throat and mouth of their fowls, regard the disease as quite different from the catarrhal form, and call it 'canker,' which is probably a popular form of the word 'cancer.' Whether the disease is characterised by false membranes, offensive discharge, or cheesy masses, the cause is the same, as we have many times experimentally demonstrated. At one or several places in the mouth or throat, these yellowish, smooth, or uneven membranes appear, and either remain small and disappear after a few days, or grow thicker, spread, and become firmly attached to the mucous membrane; and if they (the false membranes) are removed, an uneven bleeding surface is exposed, which looks like a true cancer. After the appearance of the membranes, the adjacent submucous tissue sometimes becomes inflamed, and finally the growths are found to be similar to those so often seen at the side of the face, containing solid cheesy matter in the centre. When the throat is blocked by these false membranes, the animal's breathing becomes abnormal, and the air passing through the throat produces loud noises. Gradually the visible mucous membrane and the comb turn blue, and the fowl finally dies from suffocation. The symptoms are much the same when the lungs are the seat of the disease. In dead roupy fowls

we have often found the higher bronchial tubes completely filled with solid cheesy matter, which prevented the air from passing into the lungs. Occasionally cheesy matters are found in the folds of the pleura, and in other situations.

"*The course of the Disease.*—The course of roup is usually of long duration. A simple, putrid discharge from the nose may stop in three or four weeks, and similarly false membranes may soon disappear; but generally the symptoms last for months. When the eyelids become swollen and tumours appear, the case is usually chronic. Affected birds may be better for a few days or weeks, and then become very weak again. Damp, cold weather usually intensifies the disease. It is well known that fowls may be more or less sick from roup for one or even several years; and these birds should have the greatest care and attention, for they are generally the cause of new outbreaks. Once introduced, roup may remain in a flock for many years. The first cold and moist nights of the fall and early winter cause all kinds of catarrhs, which in many instances are followed by roup. Roup spreads rapidly in the winter time, and may attack from 10 to 90 per cent. of the fowls in a flock. Towards spring, the disease gradually disappears. During the summer months, a few birds remain chronically affected, and then the first cold nights give the disease a fresh start. Young fowls and fowls of the fine breeds are especially liable to roup. While some poultry men maintain that birds once having suffered from roup never take the disease again, most of the experimental evidence tends to show that no acquired immunity exists, as sometimes happens after other diseases. Some fowls, are, however, naturally immune, and never take the disease. In the course of our own experiments, a white chicken, which had never had roup, was inoculated with repeated and large doses of the roup germ, but without effect.

"*The cause of the Disease.*—Many opinions have been expressed as to the cause of the disease, and some of these have been based on scientific research, while others have been mere guesses. Some writers have thought that the disease is due to 'Protozoa,' a low form of animal life; and others have isolated various bacteria from the disease tissues, which bacteria, when grown in pure culture and introduced into healthy hens, have produced symptoms of the disease.

"*Results of work at College.*—The first experiments were conducted to find out *whether or not roup was an infectious disease*, and for this purpose ten healthy fowls, which had never been exposed to infection, were confined in a cage with diseased birds; and, after varying periods of time, five of the healthy birds caught the disease. Fourteen healthy birds were then treated by rubbing a portion of the false membrane, or putrid nasal discharge from roupy birds, upon the normal, or slightly scratched, mucous membrane of the nose or eyes; and in this way, two birds were infected with typical roup. These experiments, therefore, show the infectious nature of the disease; but the degree of infectiousness was not

large. We must, however, remember that when fowls are kept under natural conditions where they are subject to cold, &c., the infectiousness may be much increased. Having thus shown that roup is infectious, the next step was to isolate the causal micro-organism, a task of some difficulty, on account of the fact that the discharge from the nose, the false membrane, &c., is in close contact with, and likely to be contaminated by the air and food, which always contain large numbers of bacteria that find suitable material and favourable temperature for growth in the albuminous secretions of fowl. Very many bacteria were isolated, but when inoculated into healthy chickens they proved to be harmless. In other infections, such as fowl cholera, &c., it is comparatively easy to isolate the causal organism, because it is found in the blood and organs of the diseased fowl; but in roup we find that, as a rule, the organs and blood are free from bacteria, or else if bacteria are present, they are harmless. Without giving the results of a long-continued series of fruitless examinations and experiments, made within the last four years, we may say that at length we have isolated a germ which causes roup, with all its varied symptoms. To this germ we have given the name *Bacillus cacosmus* (ill-smelling), and shall refer to it as the 'roup bacillus.' Chronic diseases, of which we have an excellent example in roup, are notoriously hard to reproduce by the inoculation of healthy animals, because in most cases of sickness there must be, not only *the causal organism*, but a lowering of the vital forces; and, to get over the difficulty, we used pigeons, which are easily infected, to increase the virulence of the causal organism and thereby assist in the infection of hens. In this way, we produced roup in hens at pleasure by inoculation with the roup bacillus, taken from roupy pigeons. The 'roup bacillus' is especially difficult to isolate in cases in which the bird has had the disease for a long time, as the tumours and false membranes contain many other kinds of bacteria in large numbers. In our experiments, even when roup was produced in healthy fowls by inoculation with pure cultures of the roup 'bacillus,' the mucous discharge from the very beginning contained many kinds of bacteria. The roup germs seem capable of remaining in a sort of dormant condition in the depths of the tissues for a long time—so long that the fowls sometimes appear convalescent; suddenly, when the constitution is weakened by a cold or other causes, the roup germs become active and the roupy symptoms reappear.

"To sum up, roup, or fowl diphtheria, canker, &c., is a complex of suppurative processes, taking place especially in the heads of fowls. This suppuration may be caused by different species of bacteria, and these may be very widespread, and thus an outbreak of roup may occur in a flock living in unsanitary conditions, without any previous introduction of the germs from elsewhere; but certainly this is the exception. More often the disease is spread by sick fowls introduced into healthy flocks. Germs generally are spread throughout a yard by means of the secretions, although these do not always contain the causal organism.

The infected fowls are not very much different in their general appearance and condition at the beginning of the disease, and thus they often take food and water for a long time, contaminating the food-troughs and cups. As the germs cannot infect fowls so long as the mucous membranes are intact and healthy, the disease does not spread for a certain length of time, although the germs may be present almost everywhere in the yard. Then comes a change of weather, such as a cold night or the beginning of fall and winter, and suddenly the infectiousness of the disease is increased and roup spreads rapidly among the birds. Unfavourable weather, which causes colds and other infections of the mucous membranes, directly opens the way for infection. But it is possible that the roup bacilli, having infected a number of fowls, may gain so much in virulence as to be capable of entering into the tissues of the fowl without previous colds. Like colds, other circumstances which weaken the constitution of the fowls, such as unsuitable feed or feeding, unhygienic yards, bad water supply, &c., contribute towards the spread of the disease. Once present in a poultry yard, the roup-causing bacilli cannot be got rid of, unless by very careful disinfection, and this is valueless so long as any of the fowls are diseased; and, as we have already stated, fowls often remain affected with roup, carrying the germs in a semidormant state, for months or years. It is possible that just one kind of bacillus—for example, our 'roup bacillus'—causes an outbreak of roup; or an outbreak may be caused, as here at the Ontario Agricultural College, by several species.

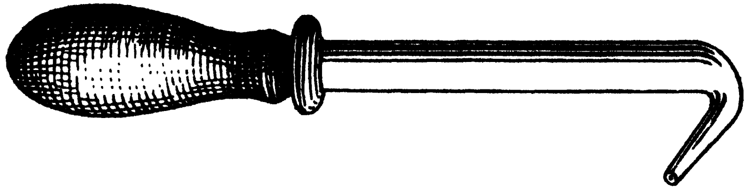
"*Treatment and Preventives.*—As roup is not a specific infectious disease—that is, a disease caused by a single species of germ—it is almost impossible to prepare a preventive or curative serum. Hence this method of treating infectious diseases cannot be used in roup; and, besides, it would be very costly. The germs of roup are not very resistant: they can easily be destroyed when present in cultures, or somewhere outside the animal; but in the animal tissue, they are very difficult to kill, because they penetrate into the tissue, and unless this, too, is killed, the germs continue living for a long time. Roup may be cured by remedies, if the treatment is careful and judicious. Obstinately reappearing false membranes can be successfully treated by burning the diseased tissue with a strong acid (hydrochloric acid, 50 per cent. to 75 per cent.), or other caustics, such as silver nitrate. If the eyes and nose are attacked, they have to be carefully washed, at least twice a day, with an antiseptic solution, such as 2 per cent. boracic acid in a decoction of chamomile flowers, or ½ per cent. solution of corrosive sublimate. Thus, the microorganisms are killed, or, at least, the diseased products which are discharged are removed, and the irritation caused by them; also the transformation into large cheesy masses is prevented. We had chickens badly affected with roup of the eyes, which were cured with boracic acid and chamomile. On account of the smallness of the nostrils and nasal canals, it is difficult to get the antiseptic solutions into the nose and nose

cavities, but it can be done with a small syringe. If this treatment is too troublesome, then the nostrils, at least, should be washed and opened several times a day, to allow the secretions to pass away. We have treated chickens for fourteen days by daily washing with a 2½ per cent. solution of creolin and glycerine. After the washings, small plugs of cotton wool, filled with mixture, were placed in the nostrils and lachrymal ducts. This remedy did not cure the roup in the head, although the same mixture readily kills the roup bacillus in cultures in from two to three minutes. The greatest hindrance to a sure cure by remedies which have been used locally, is the ability of the germ to penetrate into the tissue and the many secondary cavities of the nostrils which cannot be reached by the antiseptics. Another method of treatment which gives excellent results, especially in the earlier stages of roup, is the use of 1 or 2 per cent. of permanganate of potash. Fowls are treated in the following manner:—The nostrils are pressed together between thumb and forefinger in the direction of the beak two or three times. Pressure should also be applied between nostrils and eyes in an upward direction. This massage helps to loosen the discharge in the nostrils and eyes. The bird's head is then plunged into a solution of permanganate of potash for twenty or thirty seconds—in fact, the head may be kept under the solution as long as the bird can tolerate it. The solution is thus distributed through the nostrils and other canals, and has an astringent and slight disinfecting action. This treatment should be given twice a day, and continued until all symptoms have disappeared. If there are solid tumours in the eyelids, they should be opened so that the skin may bleed freely. The cheesy matter should be removed, and the surrounding membrane touched with a 5 per cent. carbolic acid or silver nitrate solution, and then a cotton plug filled with some antiseptic solution put into the cavity. The cavity has to be washed out daily with an antiseptic mixture, and a fresh cotton plug put in again to prevent the cavity from healing too quickly. We have cured chickens in this way in about a fortnight. As all these methods of treatment demand a great deal of time and care, they cannot well be used for whole flocks, but the more valuable fowls may be treated in this manner. Farmers and poultry men should first try the permanganate of potash method of treatment, as it is the easiest to employ. Food remedies influence roup only by strengthening the fowls and assisting nature to throw off or conquer the disease. As in other infectious diseases, the most important thing is to prevent an outbreak, or to suppress it as soon as possible. All diseased fowls should be separated from the healthy ones, and the healthy ones should be examined daily, with a view to isolate newly-affected birds. After the isolation of the diseased birds, the poultry-yard should be disinfected thoroughly with a 5 per cent. solution of carbolic acid, followed by a careful whitewashing of the walls, &c. Slightly diseased fowls, or any of special value, can be cured if much care be taken. Less valuable birds, which it will not pay to treat, should be killed as soon as manifest symptoms of the disease appear, especially when the face becomes swollen. These fowls, unless the

best care is taken, will remain diseased for months, or perhaps years, and give rise to fresh outbreaks whenever an unfavourable season (with much wet, cold weather) occurs. The most effective preventive for roup is to keep fowls in good sanitary conditions—in dry, roomy yards, and dry, clean, airy houses which are free from draughts, and can easily be cleaned and disinfected."

The above exhaustive experiments are all conclusive enough. There are, however, other treatments which have been proved equally curative.

Personally, I have found the simplest and most effective of all methods to be as follows:—Visit the roosting-place at night, and examine each fowl for any watery discharge from the nostrils. Such may not be apparent at sight; the finger should then be pressed on the outside of the nostrils in a downward direction, and if the slightest moisture is visible the subject is then one for treatment. A small vessel containing kerosene should be taken to the hen house, and when, by repeated pres-



Syringe for injecting remedies up nostrils and roof of mouth.

sings, all the watery matter is removed, three or four drops of kerosene should be syringed up the nostrils, and the same into the cavity in the roof of the mouth, the most suitable syringe being that shown in the illustration, with bent tube and rubber bulb. One or two applications is usually successful in arresting the discharge, and prevent further developments. In more advanced stages, when the discharge is becoming thick, a few drops of carbolic acid can with advantage be mixed with the kerosene.

Another simple remedy for simple cases is to dissolve a piece of sulphate of copper (bluestone), say, the size of a hazel nut, in a gill of water. Two or three drops of this should be applied with a syringe in the same way as the kerosene. The effect, however, is different. The liquid converts the discharge into a thickish matter of a white colour. This should be squeezed out of the nostrils, and the syringing and the pressing should be repeated until the secretion ceases.

In severe cases, such as those treated at the Ontario College, only on valuable prize fowls should cures be attempted, for even when accomplished the disease is latent, and it may break out at any future time.

Farmers and others who breed fowls for market purposes only, should never attempt cures on these advanced cases, while any of the simple methods shown will be effective in preventing any serious cases of this offensive and most destructive of all the diseases of the poultry yard.

(To be continued.)

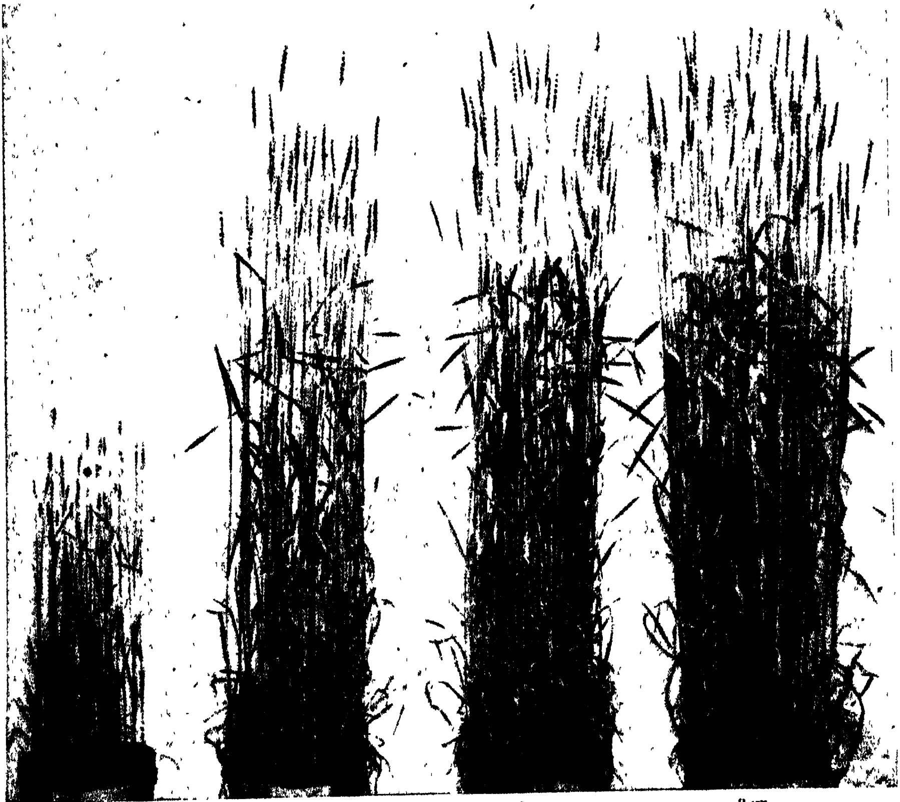
The Plants' Supply of Nitrogen.*

F. B. GUTHRIE.

THE question of the plant's supply of nitrogen is one of the most interesting of the problems presented to the agriculturist; it is also one of

Wheat.

The pots were manured with phosphoric acid, potash, and



nitrogen, in the form of nitrate of soda.

Showing the effect of nitrogenous manuring upon wheat.

the most obscure and least understood. A large proportion of the dry matter of all plants consists of nitrogenous material, and this portion of its structure is of fundamental importance to the plant. Further, it

* A lecturette originally delivered before the Royal Society of New South Wales in June, 1906.

is upon the nitrogenous matter of plants that animals depend for their proteid material—blood, flesh, &c.—since animals can only utilise for this purpose nitrogenous material already elaborated in the tissues of plants or other animals.

The ultimate source of all this nitrogenous matter is the free nitrogen in the atmosphere. It is the study of the different methods by which this element is brought (naturally or artificially) into combinations in which it can be utilised by the plant that will form the subject of the present article.

Oats.

The pots were manured with phosphoric acid, potash, and

0 gr. 1 gr. 2 gr. 3 gr.

nitrogen, in the form of nitrate of soda.

Showing the effect of nitrogenous manuring upon oats.

The plant may absorb its nitrogen in two ways, either by means of its leaves from the free nitrogen or from the ammonia or the nitric acid in the air, or by means of its roots.

With regard to the first of these, the absorption of nitrogen by means of the leaf, the question cannot be said to be definitely settled at the present time; the consensus of opinion, however, is that if such absorption takes

place, it does so to a very limited extent, and is insufficient to constitute part of the economic functions of the plant.

By means of its roots, however, the plant absorbs nitrogen, either in the form of nitrates, nitrites, or ammonium salts dissolved in the water of the soil.

It appears probable that the nitrogenous material taken up by the plant from the soil by means of its roots enters the plant in the form of nitrates. In the case of leguminous plants, as we shall see later on, the free nitrogen contained in the air imprisoned in the soil can be made use of under certain conditions by the roots of these plants.

Cabbage and Mangolds.

The pots were manured with phosphoric acid and

0 gr. 2½ gr. 5 gr. 7½ gr.

0 gr. 2 gr. 4 gr. 6 gr.

nitrogen, in the form of nitrate of soda.

Showing the effect of nitrogenous manuring upon cabbages and mangolds.

Formation of Nitrates in the Soil.

It has long been known that the addition to a sterile soil of a quantity of a more fertile one rendered the sterile one fertile; and the operation of top-dressing poor soils in this manner was a common one amongst the nations of antiquity.

When the subject was approached in the light of more recent advance in scientific knowledge, it was shown that this increase in fertility was

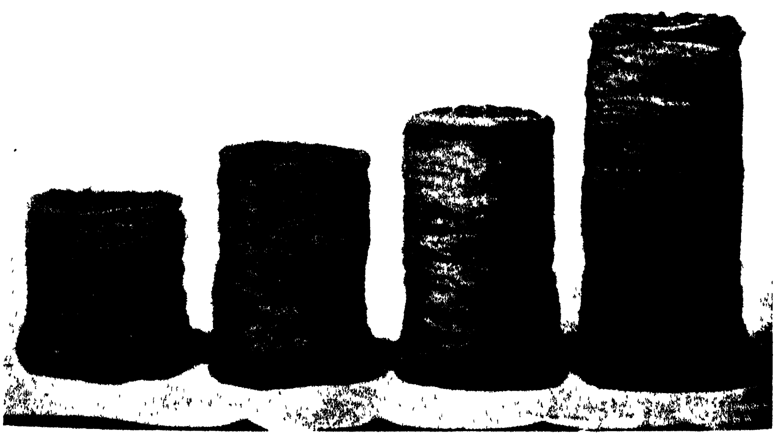
Potatoes.

The pots were manured with phosphoric acid, potash, and

0 gr. 1½ gr. 3 gr. 4½ gr.

nitrogen, in the form of nitrate of soda.

Showing the effect of nitrogenous manuring upon potatoes.



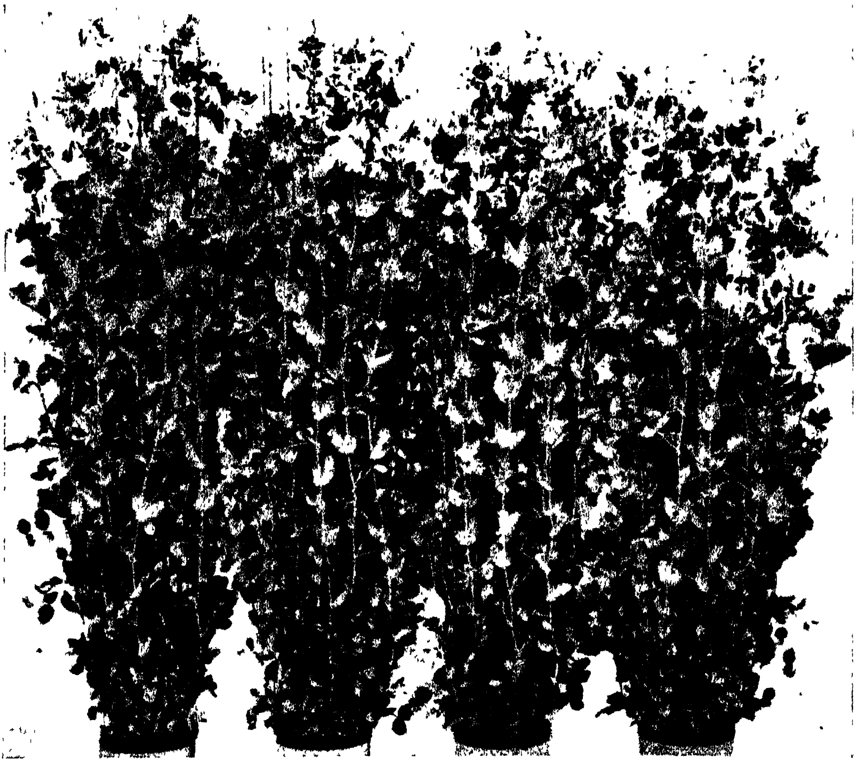
Manures per acre, nil.	1¼ cwt. nitrate of soda, without phosphates and potash.	Phosphates and potash, without nitrate of soda.	1¼ cwt. nitrate of soda, with phosphates and potash.

Field experiments, showing the effect of nitrogenous manuring upon potatoes, conducted at the Agricultural Experiment Station, Darmstadt.

accompanied by an increase in the quantity of nitrates in the soil. How it was that the addition of so small a proportion of a soil containing nitrates could bring about the large increase of nitrates observed was a problem which remained unsoluble, until the discovery by Pasteur of organisms capable of inducing fermentation and of producing certain chemical substances as by-products paved the way for a rational explanation of the process. Pasteur himself surmised that this gain in nitrates was due to bacterial activity.

Peas.

The pots were manured with phosphoric acid, potash, and



0 gr. 1 gr. 2 gr. 3 gr.

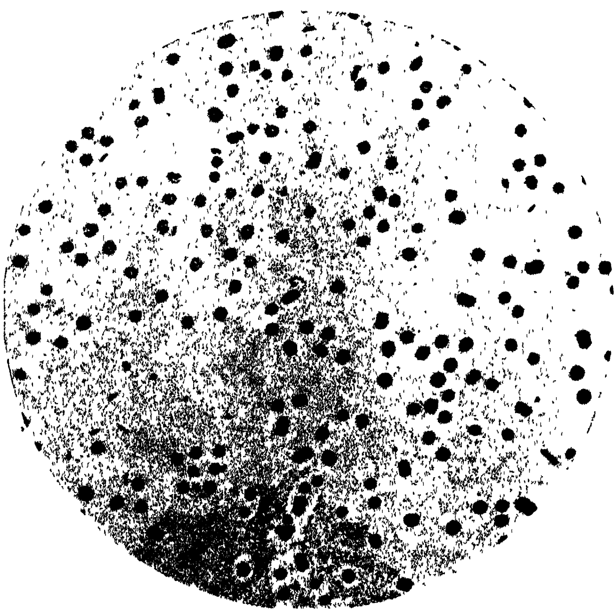
nitrogen in the form of nitrate of soda.

The experiment shows that peas (in common with other leguminous plants) attain their utmost development withou nitrogenous manuring, since they are able to take from the atmosphere the nitrogen which they require.

From Nitrogenous Organic Matter.

In 1877, it was shown by Schloessing and Müntz that the formation of nitrates (nitrification) only took place within certain temperatures, and that it could be entirely stopped by antiseptics—such as chloroform vapour—showing that nitrification was brought about by the action of organisms.

We know now that quite a number of different organisms take part in the conversion of organic nitrogenous material into nitrates. In the first stage of the process, the nitrogenous matter in vegetable or animal refuse is converted by putrefaction into humus, carbonic acid being evolved and the nitrogen converted into simpler forms such as amides (*asparagin, urea*) and ammonium carbonate; the familiar odour of stables and dung-heaps being due to the ammonia evolved. Quite a number of bacteria and moulds possess this power of converting albumenoid matter into ammonium salts. In ordinary manure heaps moulds produce this decomposition; in arable soils it is brought about by the action of bacteria (particularly by *Bacillus mycoides*, which is widely distributed in the



Nitrous ferment prepared by Winogradsky from soil from Cito.

surface-soils, air, and water). The further nitrification of ammonium salts is the work of yet other bacteria.

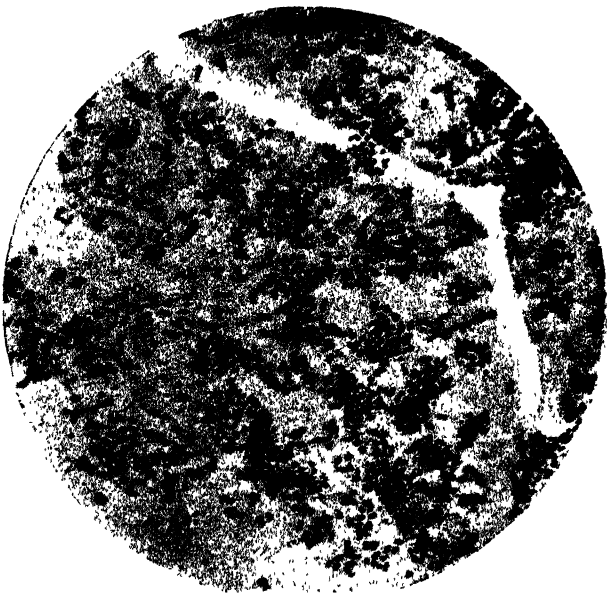
Warington first showed that there were two distinct stages in the conversion of ammonium salts into nitrates, and that nitrites were formed as an intermediate oxidation. Consequently, there must be two distinct organisms involved.

In 1890, these were isolated by Winogradsky, who found two distinct organisms capable of converting ammonium salts into nitrites—namely, *nitrosomonas europœa*, occurring in soils of the Old World, and a nitrococcus, which he found in American and Australian soils.

The further conversion of nitrites into nitrates is the work of another organism, of the genus nitro-bacter.

Frapps has recently identified a fourth organism, which it is stated converts nitrogenous organic matter directly into nitrites and nitrates. The process takes place, more or less vigorously, in all soils not absolutely destitute of organic matter, but there are certain conditions which are more particularly favourable to the process. They are—

1. The presence of suitable food for the growth and development of the organisms, such as lime, potash, sulphates and phosphates, and free carbonic acid.
2. Suitable temperature. The optimum temperature being about 35° to 36° C. Nitrification is stopped at temperatures over 50° to 55° C., or at 0° C.



Nitric ferment prepared by Winogradsky from soil from Cito.

3. The presence of a base to combine with the free nitrous and nitric acids formed. Carbonate of lime is the most suitable. The presence of free acid prevents nitrification, so does excessive amount of alkali (carbonate of soda).
4. Moisture.
5. Absence of too strong light.
6. Presence of sufficiency of oxygen (the process is essentially one of oxidation).

From the Nitrogen of the Air.

We have, so far, discussed the question of the plants' supply of nitrates (which are the principal source of the plants' nitrogen), and we have seen

that these are derived from the decomposition of animal and vegetable nitrogenous matter within the soil. How is this material, in its turn, derived from the free nitrogen of the air, for that must be its ultimate source? Atmospheric nitrogen is converted into organic material in nature in several ways.

Roots of Crimson Clover, showing nodules.

Quite a number of free-living organisms have been isolated during recent years which have the power of fixing the free nitrogen of the air, and thereby enriching the soil in nitrogenous material and nitrates.

The *azotobacter chromococcum* (for example) of Baeyerink is capable of fixing atmospheric nitrogen in a medium in which nitrogenous matter is absent, the fixation being due to the presence of lime, and is much more active in soils rich in lime.

These free-living organisms do best in soils containing organic matter, but poor in nitrogen. Hall thinks that, as in the case of the nitrifying organisms, the fixation depends upon the oxidation of carbo-hydrates, which supplies the energy.

Henry has recently found that decaying leaves of forest trees, such as oak or beech, possess the power of fixing free atmospheric nitrogen in considerable quantities. The fallen foliage on the surface of the ground in an oak-forest accumulates 13 kilogrammes of nitrogen per hectare annually (11½ lb. per acre). In the case of beech leaves, 22 kilogrammes is annually accumulated per hectare (19¼ lb. per acre).

Roots of garden pea, showing nodules.

By the Root-nodules of Leguminous Plants.

An extremely interesting instance of the absorption of free nitrogen by a certain class of plants was first observed by Hellriegel and Willfarth.

The roots of leguminous plants when vigorously growing develop small nodules or excrescences, which contain bacteria capable of fixing the free nitrogen in the interstitial atmosphere of the soil, and of handing it over to the plant in a form in which it can be readily assimilated. The process is either symbiotic or parasitic, and is quite distinct from the fixation of nitrogen by the free-growing organisms, and explains the enormous gain in nitrogen found to result by the growing of a crop of clover, peas, or vetches. The growth of such a crop, even if not turned under, enriches the soil in nitrogen by the production of these nitrogen-fixing bacteria.

Pure Cultures of Nodule Organisms for use.

Many attempts have been made to prepare pure cultures of these organisms, for use in directly inoculating either the seed or the soil. The best-known of these was a preparation originally prepared by Professor Nobbe, and known as "Nitragin," which has been in use for many years and which consisted of gelatine cultures of these organisms. Its use was not attended by universal success, and many attempts have been made to prepare by other methods cultures of these organisms which shall possess greater vitality and be of more universal practical application. The best known of these in recent years have been prepared by Professor Hiltner, in Germany, and Dr. Moore, of the United States Department of Agriculture.

Reports of exact experiments conducted with these cultures in England, Canada, and South Africa show that it is premature to claim for them anything like certainty in ordinary farm practice. Our own experiments with Dr. Moore's cultures, both in pots and in the field, have likewise yielded disappointing results, and the fact is forced upon us that the reports of the remarkable results alleged by the American magazines to have resulted from their use have been much exaggerated. It is always quite possible that some method of preparing these cultures will be devised by which the vitality of these organisms may be retained and their use made of practical value for farm-work.

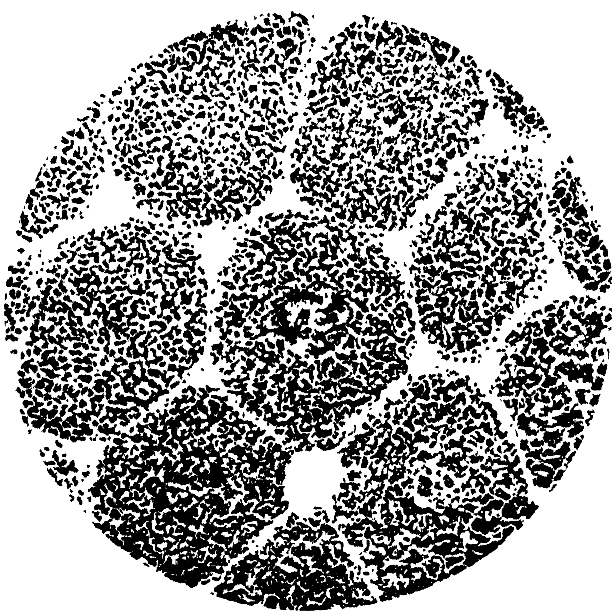
Roots of Velvet Bean, showing nodules.

Artificial Fixation of Atmospheric Nitrogen.

The free nitrogen of the air can then be utilised in the manner above noted by plants for their growth, principally by means of free-living organisms within the soil and by the bacteria in the root-nodules of leguminous plants. A point of the very greatest importance to us is,

can we produce artificially this nitrogen absorption? Can we convert atmospheric nitrogen into a form in which it can be utilised by the plant? The importance of this point is enormous, for nitrogen is one of the essential constituents of the food of plants, and owing to the soluble nature of the nitrates produced by the soil, it is continually being washed out by rain into the subsoil beyond the reach of the plant-roots. Consequently, it is necessary to constantly replenish it, and this is done by manuring

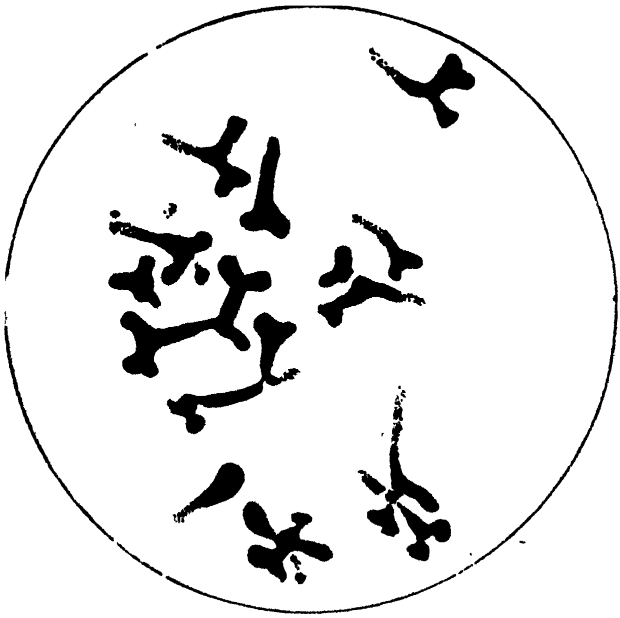
Manures such as blood, bone-dust, stable manure, nitrate of soda, and sulphate of ammonia, owe their value to the nitrogen they contain, and enormous quantities of the more concentrated manures, such as nitrate of soda and sulphate of ammonia, are used for this purpose. Nitrate of soda is at present exported from a narrow strip of land east of the Andes. The present export is about 1,500,000 tons per annum, equal to



A few cells from a lupine nodule, much enlarged to show the bacteria.

£16,000,000. It is expected that the deposits will be exhausted by 1950. It is not only the most important, but the most expensive of the fertilising ingredients, costing about 8½d. per lb., potash costing about 2½d., and phosphoric acid costs about 1½d. to 2½d., according to its solubility. If a cheap method of fixing the nitrogen in the limitless expanse of air could be devised, it would bring about the most important results in the increase of the yield of farm crops. Many attempts have been made to do this, but so far they have not resulted in the production of an economic manure. Nitrogen is one of the most difficult elements to force into combination; it combines directly with only a few elements.

The text-books tell us that nitrogen is the most inert of elements. It would, however, be fairer to say that it is characterised by a highly-aristocratic exclusiveness, a strong disinclination to mix with socially inferior elements. So strongly marked is this characteristic, that even when it has been coaxed into combinations (such as nitro-glycerine, picric acid, nitrogen chloride, &c.) it sets itself free on the slightest provocation, and with explosive violence. On account of this aloofness, it has not as yet been possible to devise means whereby atmospheric nitrogen can be made to combine readily and cheaply in such a form as to be available for plant-food when applied to the soil. Recently, however, experiments have been carried out in one or two directions which contain considerable promise of success, and the future developments of these processes will be watched with extreme interest by all of us.



Branching forms of bacteria from a clover nodule, much enlarged.

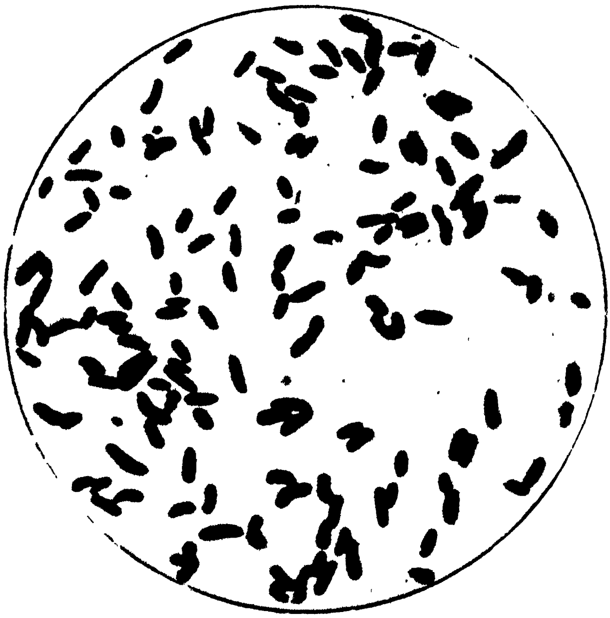
Calcium Cyanamide.

When air from which the oxygen has been removed, and which is practically pure nitrogen, is passed over calcium carbide at a white heat, it combines, forming a compound known as calcium cyanamide (Kalkstickstoff), $CaCN_2$, in the form of a fine black powder. This is readily converted by water into ammonia—

$$CaCN_2 + 3H_2O = CaCO_3 + 2NH_3$$

The crude cyanamide has been found to possess manurial value, due, no doubt, to the production of ammonia. The result of trials with it

at Rothamsted and several of the German experiment stations show that while it has a distinct manurial value, there is nothing to show that it has a higher manurial value than sulphate of ammonia, with which it cannot compete in price, at least at present. There are certain disadvantages connected with its use; for instance, it must not be used as a topdressing, as loss of ammonia results, nor must it be mixed with superphosphate, as the mixture becomes hot. It is most efficient when sown about ten days before the seed, as when sown with the seed it has a markedly injurious effect upon the germinating power. It is most effective when mixed with peat, or applied to peaty soils, the peat no doubt acting as an absorbent for the



Rod forms of bacteria from a fenugreek nodule.

ammonia. It may be said that its future success depends upon whether it can be produced at a cost which will enable it to compete with ammonium sulphate or nitrate of soda.

Production of Nitrogen by Electricity.

Another more recent, and apparently more promising, method of utilising atmospheric nitrogen, has been rendered possible by later developments in electricity. When air is sparked, the nitrogen and oxygen combine to form nitric oxide, which in the presence of water becomes nitric acid. This happens always in the neighbourhood of electrical machines, and the lightning-flashes during thunderstorms also

produce the same result, so that the air during thunderstorms always contains small quantities of nitric acid. Many attempts have been made to utilise this action on the manufacturing scale. The only one of these which have had any measure of practical success was Bradley and Lovejoy's, which was in operation at Niagara Falls until 1904. The latest

Effect of poor sandy soil upon formation of nodules of Soy Beans.

and most successful of these processes is that patented by Birkeland and Eyde in 1903 (see J.S.C.I., 1905). This is being carried out a Svaelgfors, in Norway, where works have been erected utilising 30,000 horse-power and producing large quantities of calcium nitrate for use as a manure. The several features of the process are the following:—Air is led into a specially constructed electric furnace, where it is heated to a very high

temperature by an electric arc, spread out into a fan shape under the influence of powerful electro magnets. The oxides of nitrogen formed are

Effect of poor clay soil upon formation of nodules of Soy Beans.

passed into towers, where they are dissolved in water and concentrated. The whole of the gases are not, however, absorbed by the water, as it is so diluted with the air which passes with it that at least half escapes

Effect of rich nitrogenous soil upon formation of nodules of Soy Beans.
Nodule-formation is most vigorous in poor soils deficient in nitrogen.

absorption. This is passed into a tower charged with milk of lime, where it is converted into nitrite and nitrate of calcium. By further treatment with

nitric acid, a calcium nitrate, containing about 13·2 per cent. nitrogen, is formed (pure $Ca(NO_3)_2 = 17$ per cent. nitrogen). It is placed in the market either in this form (either fused or in crystals) or, preferably, by converting it (Messel's process) into a basic salt by calcining it with lime, this product being non-hygroscopic, whereas calcium nitrate absorbs water from the air and becomes moist. This is a point of considerable importance in determining its value as a manure.

Calcium nitrate appears to be just as effective as sodium nitrate containing the same amount of nitrogen. I have no information as to the cost of manufacture. The determining factor is, of course, the cheapening of the unit-cost of the current, by the provision, for example, of water supply adequate to produce the requisite power at a cheap rate.

Eradication of Sweet Briar.

Mr. J. H. McIntosh, Bunnamagoo, Rockley, has kindly supplied particulars of his successful experience with regard to the eradication of this pest.

"My method has been as follows:—A cable chain with a ring on one end is put round the butt end of the briar, and the other end of the chain is passed through the ring, and a team of six bullocks is hooked on to the loose end. The effect of the pull is that the chain tightens round the butt of the briar, and the whole briar, roots and all, is drawn out. Of course, some of the smaller roots break off, and these are taken out by men with mattocks. This should be done when the briar is in flower, as the sap is then up, and there is less likelihood of the broken roots sprouting. Even then there are always sprouts; and to overcome this difficulty, and avoid the expense of sending the mattock men again over the ground, I put on a large number of sheep (ewes and lambs are the best). The sheep are very fond of the young shoots, and readily nip them off as they show up, and this eventually kills the plant. When the briars were not large enough to hold the chain, growing, as they occasionally do, something like stooks of wheat, the men had to mattock them out. I at first used a traction-engine to pull out the large briars, but found that this was not a success, as the briar sometimes stripped off at the surface of the soil and left the tap-root in the ground, and this was very troublesome to get out with the mattocks. I also tried horses, but they did not pull steadily enough, and I found in this respect that the bullocks, being very steady, acted the best. The summer time is certainly the best in which to carry out the work. I may say that, though the briars were taken out some seven or eight years back, there is now no sign of any shoots, so that I have no doubt they are done for."

Butter and Butter Substitutes.

THEIR PRODUCTION AND SALE.

M. A O'CALLAGHAN.

SINCE the alteration in dairying methods about twenty years ago, whereby the manufacture of butter, instead of being an irregular, haphazard affair, became controlled and governed by certain scientific principles, its consumption as an article of food throughout the world has increased beyond all imagination. This is due to many things. First, perhaps, are the great improvements which have taken place in the article itself, together with the fact that it may now be obtained at a fair market price and of good quality throughout the various months in the year. The second cause for increased consumption might be put down to an increase in the world's wealth and population, together with a better education as to the value of good butter as an article of diet.

However, without improved methods for preservation, all these would be more or less useless, because, no matter how great the desire, the densely populated countries of Europe would not be able to obtain a butter of good quality unless partly supplied from countries like Australia, Canada, and Siberia; and these latter countries would not be able to deliver in Europe a first-class butter without, in the first instance, properly refrigerated and controlled factories for the manufacture; and in the second instance, thoroughly equipped boats from a refrigerating point of view.

This great demand for high-class butter on the Englishman's breakfast table has caused all countries with an eye to commerce to pay special attention towards developing a trade in butter and in butter substitutes with England. It is this which has developed our coastal areas and which has caused land on the Richmond River and other coasts to sell as high as £30 per acre, and it is this also which has opened the great tract of country known as Siberia to settlement by Europeans.

It is all the more wonderful when we consider what the condition of things was twenty years ago. In 1886 the butter imports into England were valued at £8,141,438, whereas in 1905 the estimated value was £21,585,622. In 1886, 2 tons of butter were received in England from Australia, and 5 tons from New Zealand; and up to 30th April, 1906, the total quantity of butter handled from these places—namely, Australia and New Zealand—amounted to 283,895 tons, estimated as being worth £27,000,000 sterling. This is the source from which money came to develop and settle our great dairying districts, and it is this export trade that is causing the dairying industry to be taken up in many districts in New South Wales hitherto unthought of from this point of view, and undeveloped from the closer settlement point of view.

In New South Wales the history of our exports has been somewhat as follows:—Ten years ago our export to London was valued at about £100,000, whereas for this year our export of butter should reach something near £1,000,000 sterling, and the industry is yet only in the development stage.

As showing the development in production, as well as alteration in the method of manufacture, the following figures will be interesting:—In 1896 the amount of butter made in factories in New South Wales was 18,828,293 lb., while that made on the farm amounted to 7,045,984 lb., or a total of 25,874,277 lb.; while in 1903 these figures had grown to 34,632,957 lb. made in the factory, as against 4,094,150 lb. made on the farm, the total being 38¾ million lb. approximately. The figures for 1905 were—factories, 48,233,269 lb.; farm factories, 230,905 lb.; and farm, 4,576,076 lb. Total of 53,040,250 lb.

Siberia.

I shall now take the development in Siberia, and here we have, perhaps, the most phenomenal results yet shown by any country. In 1897 the total amount of butter imported from Russia (which includes Siberia) was 9,078 tons, while for the year ended 30th June, 1906, despite all the hardships of the late war, amounted to 25,327 tons, which, at £100 per ton, would work out at over 2½ millions sterling for the year's work.

Almost all this development, which came under the heading of "Russia," is attributable to the extension of the dairying industry to Siberia from Asiatic Russia. As showing that this amount is still a rapidly-growing one, it might be stated that, for the first nine months of this year, Siberia delivered 22,798 tons as against 18,078 tons for the same nine months of the previous year, viz., 1905. When we consider this rapid and vast development, we must acknowledge that Siberia has rapidly become a competitor of ours on the English butter markets; but she is not as serious a competitor of ours as these figures may lead one to understand, and for this reason, that whereas the bulk of Siberian butter is produced during the months of May, June, July, August, and September, our chief production is obtained during the other seven months of the year; and whereas Siberia competes for the same butter trade of England when prices are lowest and butter most plentiful in Europe, we compete mainly during the time when butter is scarce and dearest, viz., during the late autumn and winter, and early spring in England, which, of course, owing to our position in the Southern Hemisphere, contrasts with our most plentiful period, and that in which the cost of production is cheapest.

Yet, owing to the greatly improved facilities and methods for the preservation of butter, while held in cold store, Siberia will affect us more in the future than we may expect, unless the quality of our butter proves to be considerably superior to theirs.

We all know pretty well the general history of dairying development in Australia, and what has been done by the Governments in the various

States towards fostering this industry; but, in order to understand the possibility of such a rapid development in Siberia, it will be necessary to go a little into the history of the movement in that country.

The first dairy for the manufacture of butter for export in Siberia was erected in the year 1893, yet in ten years afterwards the number of these dairies had grown to be over 2,000, and since then, viz., 1904, the development has been very great. In 1900 the export of butter from Siberia into England was valued at under £1,000,000 sterling. For 1906 there is no doubt the figures will reach £2,500,000 sterling, and in addition to this there will probably be quite £500,000 worth sent to countries other than England. It seems marvellous that such a great commercial development should have taken place in so short a time in a country which the average European, as well as, no doubt, the average Australian, looked upon until recently as being notorious only for its snow, its trackless wastes, and its political exiles.

Yet such has come to pass, and the result only shows how unreliable were our ideas regarding this country, which really contains great tracts of rich virgin soil, capable of immense production.

The Russo-Siberian railway, which extends right through the country, has been the main developing factor, because, while it enabled the farmer to carry his produce considerable distances to the factory, it also brought the factory into touch with the western civilisation and remunerative markets. Strange as it may appear, the first person to make butter on an up-to-date system in Siberia was an Englishwoman who had married a Russian. But since then education has been spread broadcast, and instructors, selected mostly in Denmark, have been sent through Siberia to instruct the peasants in the very latest methods. In addition, the Danes themselves, on discovering the possibility of development, emigrated to Siberia and started factories there on the same advanced methods pursued in their own country, viz., Denmark. These pioneers not only started factories, but lent money to the peasants for the purchase of cattle, produce, &c.

Now dairying constitutes the mainstay of the people in some of the most populated towns of Siberia, such as Omsk, Barnuel, Birsk, &c.—in fact, the town of Omsk has become quite a cosmopolitan centre, owing to the civilising influence of the cow, and Danish, Russian, English, and German houses have representatives established there.

Towards the development of the industry, the Russian Government has, however, not been behindhand, and they have advanced co-operative dairying companies sums not exceeding a loan of £320 on each factory at 4 per cent. The Russian Government has also appointed dairy instructors in the several districts, and placed the factories and dairies in groups under the supervision of these instructors. In the beginning the bulk of the butter was exported to England through Danish middlemen, but the Russian organisers have done a great deal towards eliminating these, in their opinion, unnecessary middlemen.

The Russian Government run several special butter trains every week during the summer season, starting in the east of Siberia and picking up other waggons at the various stations until the train load is complete. These trains travel at special speed, and take precedence of all ordinary goods trains. The trains are made up of special refrigerated waggons, and convey the butter in the shortest possible time to the port of Riga, or to St. Petersburg. From Riga the butter comes direct by boat to England, and the total cost of export, despite this extraordinary long railway journey, from Omsk, in Siberia, to London, scarcely amounts to 1d. per lb.

There is no doubt that Siberia has a great dairying future, and as before the late war with Japan she sent her butter to various places on the Pacific coast, and to China and Japan, she will, no doubt, be in the near future a serious competitor of ours on these Eastern markets. Our watchword should be "A high uniform quality," and if we obtained this from the great bulk of our factories, I have no fear but that our dairying will hold its own with all other countries, because there is no other country where butter can be produced at so cheap a rate, especially when the labour is in the hands of the producer.

Argentine.

The Argentine is another country with which we are concerned; but, perhaps fortunately for us, the development here has been nothing like what was expected some years ago, nor is there any likelihood of a great increase in the production of butter in that country. The exports to England, instead of increasing, have diminished from the Argentine, and whereas the supply in 1904 was 4,435 tons to London, the amount delivered during the year ending 30th June, 1906, was only 2,665 tons. This great decrease in export to England has, however, been accounted for somewhat by the increased development of the Argentine business in South Africa.

On the other hand, all information I have had from the Argentine goes to show that the development in that country is rather towards beef than towards butter. There are many reasons for this, one of the chief being that the cattle of the country have been developed mainly from a beef point of view, and beef production for export to England has proved so remunerative that landowners will not abandon a settled industry to enter into one of which they know little.

When I state that the cows are, as a rule, only milked once a day in Argentine—the calves being allowed to suck them during the rest of the time—my audience will understand the weak position of the Argentine farmer as far as a butter producer is concerned. Another point which militates against them is the scarcity of fuel in the inland districts, and this increases the cost of production considerably. However, the butter they make is excellent; and they have, practically speaking, captured the South African trade, to which they are devoting great attention.

Canada.

Canada is the only great country with big possibilities; but as it is also, like Siberia, situated in the Northern Hemisphere, we have not to fear them as much as any development which may take place in the Argentine. Also, Canada devotes the main portion of her attention towards perfection and development of her cheese industry, which practically controls the price of Cheddar cheese on the British markets.

This year Canada has shown a great falling-off in the supply of butter to England, as owing to the high price of cheese she has turned her attention to an increased manufacture thereof, and the falling-off is represented as follows:—217,950 cwt. were delivered during the first nine months of 1905, as against only 152,028 cwt. during the first nine months of 1906. However, her exports to England grew from 4,557 tons in 1897 to 15,145 tons for the year ending 30th June, 1906; so that you will see she sent butter to the value of £1,500,000 sterling last year.

EXTRACTS from evidence given before the Select Committee on the Butter Trade, appointed by the British Government.

(Report was ordered to be printed by the House of Commons on the 9th July, 1906.)

The evidence given before the Select Committee referred to is of considerable value to us, as it gives us the opinions of the various people concerned—from producer to consumer—regarding the conditions under which the production and sale of butter ought to be carried on.

The first witness called was Sir Thomas Henry Elliott, K.C.B., Secretary to the English Board of Agriculture. Among other things, he stated that milk-blended butter was introduced into England about the year 1900. He also stated as follows in reference to the question of production :—

8. Then, passing on to the point of the registration and the licensing and inspection of butter factories, on the same lines as was introduced into margarine factories—what have you to say? On that point, I should say that all the information which the Board of Agriculture have been able to obtain on this subject points to the necessity of striking at this evil of adulteration, as far as possible, at the source. It is much simpler in these days, when articles are produced commercially on a very large scale, to secure the proper control of the trade at the sources of production rather than in each retailer's shop. The original idea of the Act of 1875 was that you must attack the retailer; but that, no doubt, was much more true in 1875 than it is now. In these days it is essential to get to the place at which the article is produced, because, if you can purify the source you will do much, as it were, to purify the stream; and, in view of the present condition of the butter industry, the first of our suggestions, I think, would be that all places in which butter is worked, blended, or submitted to any process preparatory to sale, should be licensed and registered, so that the Board and the local authorities may see quite clearly the directions in which their most important action should be taken. Then, having, as it were, made quite clear where the premises are in which operations of this kind are carried on, our view is that officers of the Board and persons authorised by them should be empowered to enter all places in which butter is made or stored, or which are licensed or registered as above, to inspect the premises and take samples for analysis, and take samples of butter sent out of registered

factories by any public conveyance. There is a similar provision in the Margarine Act already, which has been of some service in this matter. Answer to question 9: I also think it will be essential that the owners of factories and persons engaged in the trade should be told quite clearly by Parliament or by statutory regulations what they are to do and what they are not to do; and our suggestion is that no butter should be sent out of a registered factory containing more than 16 per cent. of water.

. . . .

74. Then in what way do you consider the colonies suffer at present from the present state of the law? The colonies will be able to speak for themselves, but I think there can be no doubt that prices are depressed by the competition of what I should term adulterated articles. The whole case for legislation, from the point of view of the producers, is based upon the fact that adulteration is an unfair form of competition, and unfair competition must result in the depression of prices.

Evidence of Mr. George Pearce Sparrow, member of the firm of Mills and Sparrow, Colonial House, London:—

Answer to question 1578: I have only a day or two since been approached by a firm on the other side who are pretty large shippers, shipping, I think I may say, very large quantities of Dutch butter from Holland, who have written asking us to take consignments of their butter, and have also told us that they would give us a full guarantee of the butter, and saying that they would like to send along some samples. In reply, I wrote asking them as to whether the butter bore the Government control stamp, and their answer is: "Importers of foreign butter cannot get the control stamp." That is so far as Holland is concerned; the meaning of that being, evidently that the Government officials there will not give a guarantee of purity with the butter which has gone through those particular factories.

1579. They will not give a guarantee to the importers of the butter? No.

1580. This foreign firm imports butter from abroad? The firm who have written to us are buying fairly large quantities of colonial butter on this market and sending it over to Holland. They wish to send it here on consignment with a full guarantee of purity. We ask them whether it will have the Government control stamp, and they say: "No, we cannot get the Government control stamp, because we are importers of foreign butter." The term "foreign" is used by them, but it is really what we term "colonial."

. . . .

1769. You gave us some reference with regard to Holland which was of an unusual character, but very interesting; you stated that your association was approached by a Holland firm, who made certain offers to you? To my firm of Mills and Sparrow.

1770. To your firm, or to the association? To my firm, not to the association—to Mills and Sparrow.

1771. They made you an offer that if you would send colonial butter to Holland they would deal with you on certain terms and give you a profit of 5s. per cwt., I think you said? We were to take 1,000 boxes, I think, which would be 500 cwt., and 500 cwt. were to be returned to us and 5s. per cwt.

1772. Profit? Profit; so that we were to get the same quantity of butter.

1773. Had you accepted their offer on a transaction of that kind you would have made a very large profit? I should have made 5s. a cwt.; but then, of course, I should have had to sell the butter.

. . . .

1785. Do you think there is much of that Dutch butter coming over in Dutch casks which is not under Government control—coming to the port of London, we will say? Of course, the Board of Trade authorities and the Board of Agriculture should be able to give some definite statistics about that; but, from my knowledge, I should say there is quite a quantity. I saw a Great Western Railway three-horse van, not very long ago, coming down fully loaded with this Dutch butter. I traced it, and found it had come *viâ* Cardiff from Holland, was brought into London, put into a store here, and distributed mostly to the Midlands from London; but it had come by that circuitous route.

1786. Presumably, that butter was not butter sold under the Government control stamp? I did not get up to see the casks, but I should say that the quantity was larger than, at that particular period, they could get with the Government control stamp.
1787. Then the presumption that that butter was faked butter may, obviously, be a very probable one? Yes, quite. If I had been in a position to say to an inspector or someone: "Now, look here, there is some butter," we might have been able to see some of it.

. . . .

1790. Your suggestion is, a Government guarantee? Yes; and I say that so far as the colonies are concerned, they are willing to give that guarantee now. Denmark, I should say, would willingly give it; and the question is whether the *bonâ fide* producers and makers of Dutch butter would not also agree to it. Then you would eliminate the evil without anything further. It would be manifest that if a man could not get the Government control stamp in Holland for his butter, he was doing something in Holland which was not right.

Evidence of Mr. Alfred Samuel Page:—

1812. I think you come here to represent the Butter Association? Not altogether.
1813. Then perhaps you will just state whom you come to represent? I am a member of the Butter Association, and also of the Home and Foreign Produce Exchange.
1814. In what district? In London.
1815. And you are a member of the firm of Samuel Page and Son?. Yes.
1816. And a member of the Home and Foreign Produce Exchange, and treasurer of the Butter Association? Yes.
1817. Will you tell us what your experience has been? My firm is largely engaged in the butter trade, and I am strongly opposed to the so-called milk-blending of butter, as the addition of moisture is made solely to increase the weight, and this is not understood by the public; and even supposing there were a full disclosure by the vendors of the composition of the article, yet the sale should be prohibited if the article contains more than 16 per cent. of moisture.
Answer to question 1821: It is imperative that the genuineness of all butter imported into this country should be guaranteed by the Government of the country of origin—that is, that the system in vogue in Denmark and Holland should be compulsory for other countries.

. . . .

1927. You said, I think, in reply to the hon. member for Kirkcaldy, that the system in vogue in Denmark and Holland should be compulsory in other countries? Yes.
1928. Then, further on, in answer to another honorable gentleman, you said that adulteration last winter was rife, especially in Holland? Yes.
1929. How do you reconcile those two statements?. The butter which is exported from Holland as pure is stamped by the Government; the other gets off without a stamp.

. . . .

1932. Then why do you wish the same system, when adulteration is rife in Holland, to be compulsory in other countries? You see, pure Dutch butter has the guarantee of the Government; and I say, make that compulsory from all countries.
1933. But if that is so, how was it that Holland was able to adulterate in the way you tell us they did in 1904? Because there was no guarantee; that adulterated butter is not guaranteed by the Government.
1934. Then all butter coming from Holland is not guaranteed? No; this article I was telling you of is not guaranteed.
1935. What article? The Dutch adulterated article. The Dutch firms have been here in London buying colonial butter and taking it over to Holland and sending it back to London, actually in the original boxes, at considerably less than the price at which they could buy it in London.

Evidence of Mr. Henry Trengrouse:—

2310. You are chairman of the provision trade section of the London Chamber of Commerce? Yes.
2311. As regards the maximum amount of moisture in butter, what are your views? That the maximum should be 16 per cent.

. . . .

2335. Is there anything else you want to add to your evidence? I received a letter a few days ago, which may interest the Committee, from an old and valued correspondent in New York. This came to us quite without any reference to this Committee or butter adulteration. This is merely to show what other countries are doing in the matter. "We note that the Government inspectors are on the market here and have tied up about 3,000 tubs in cold store, for having excessive moisture. What will eventually become of it we cannot say, but it will help us to put a stop to the western butter-makers making their profits out of the over-run"—that is beyond 16 per cent. of moisture. They seem to be more active, I think, in Canada and America and other places with regard to adulterants in butter than we are in this country.

Evidence of Mr. John Adams Cooney:—

2577. You are a member of the firm of Messrs. Cooper & Company, of Liverpool? Yes.
2578. What is the business of the firm? A private grocery and provision concern.
2579. Wholesale or retail? Retail.
2580. And you are here to represent the Liverpool and District Grocers and Provision Dealers' Association.
2581. What is the membership of that association? About 1,500.

. . . .

2608. Is there any point you wish to mention? There would be little use in having factories registered in this country if we do not prohibit the importation of other butter from other countries.

. . . .

2611. It is not a question of what the Board of Agriculture does now; it is a question of future legislation? I would have a Government guarantee from whatever country it came, and unless I had that guarantee I should prohibit it.
2612. Do not you think that would interfere with trade? No; other Governments would make their arrangements; they are only too anxious to deal with us.

Evidence of Mr. Robert Graham:—

2942. You are managing director of Messrs. Wall & Co. (Ltd.), Manchester, dairy produce importers? Yes.
2943. You are an ex-president of the Wholesale Provision Trade Association? Yes.
2944. And deputy-chairman of the produce section of the Manchester Chamber of Commerce? Yes, but not of the Chamber of Commerce.
2945. Do not you represent the Chamber of Commerce? Only the Wholesale Provision Trade Association.
2946. Will you tell the Committee what is your opinion as to moisture in butter? Our opinion is that provided a uniform standard of 16 per cent. for all butters, or for everything called butter, were adopted, that would do.

. . . .

2959. Then how would you deal with the question of importation of adulterated butter? We should be inclined to prohibit that altogether, if it was persistently done, from any country.
2960. But in what way would you prohibit it;—how would you detect it? That is a question for the authorities.
2961. But what would be your suggestion? By taking samples at the ports is the only way.
2962. I ask that because it has been said that foreign Governments should give a warranty with all butter sent in? Most foreign countries and our

colonies now have their butter under a grade certificate. So that there are very few countries now but what have their butter under control, and it is right that all should have it.
2963. Your view is that all butter should be sampled at the port of entry by Government officials? Yes, certainly.
2964. And that the responsibility should rest upon the importer, in the case of the small retailer? Yes, certainly.

. . . .

3011. We are going to have colonial witnesses later on, as I understand; but is it not the case that at the present time it is an ordinary custom for colonial butter to come over here and to be blended with English butter, and then sold as pure butter? Yes; mostly in the south and west, but very little in the north.

. . . .

3112. You spoke about the scarcity of colonial butter last year; that was mixed in factories, I take it, in Somersetshire and elsewhere, with Irish and English butter? A good deal of it went to Holland.

. . . .

3125. What was done with it? We have very shrewd suspicion that it came back here in another form.
3126. Faker butter? Faked butter sold as pure butter. There was plenty of it sold in the Manchester market.

Evidence of Mr. John Kellett :—

3151. You are a Justice of the Peace, of Liverpool? Yes.
3152. And you are head of the firm of John Kellett and Son, wholesale and retail provision merchants, Liverpool? Yes.
3153. You appear on behalf of the Northern Council Grocers' Association? Yes.
3154. You include eighteen associations, covering the principal towns of Lancashire? Yes.

. . . .

3225. Are you in favour of doing away with milk-blended butter altogether? Yes, I am.
3226. Would you support a law, or a suggestion to alter the law, and put a stop to blending all colonial butter in factories in England? I would rather that it was not done.
3227. You would rather have the colonial butter pure? Yes; and I think we ought to encourage our colonies. During last year there have been distinct improvements in butter, and whilst they are doing all they can to bring it to perfection, there are certain people who are doing all they can to use it for other purposes.
3228. There are two sorts of butter coming from Holland, one being Government marked? Yes, I believe there are.
3229. You would put a stop now, in this country, to the landing of any butter from Holland which is not Government marked? I would rather that it all came under a designation, the same as Danish butter. All Danish butter has a certain brand; and all Dutch butter should be the same; and anything that came under any other condition, I should presume, had something wrong with it, and I should stop it till it was found out to be correct.

Evidence of the Right Honorable The Lord Strathcona and Mount Royal, High Commissioner of Canada :—

3296. Perhaps you will be so kind, first of all, as to tell us as regards the various Acts in Canada regarding the standardisation and maintaining of the purity of dairy products? The various Acts in force in Canada having for their object the standardising and maintaining of the purity of dairy products are as follow:— . . . 3 Edward VII, Chap. 6, known as the Butter Act, 1903. The main features of the latter Act are:—1. That no person shall manufacture or import into Canada, or offer, sell, or have in his possession for sale, any butter containing over 16 per cent. of water. 2. That no person shall mix with butter any acid, alkali, chemical, or any substance whatever, which is introduced for the purpose or with the effect of causing the butter to absorb water, or any

part of milk or cream. 3. That no person shall manufacture, import into Canada, or offer, sell, expose, or have in his possession for sale, any renovated butter, process butter, or butter which has been treated in the manner described in the preceding paragraph. 4. That the butter contained in any box, package, or wrapper branded "creamery," exported from Canada, must consist wholly of creamery butter manufactured in one place. The Act also empowers persons charged with the enforcement of its provisions to enter premises, to make examination of stock or packages and the marking thereof; and heavy penalties are imposed for obstruction or refusal to comply. The pecuniary penalties imposed under the Act are, when recovered, payable one-half to the informant or complainant.

Evidence of Mr. Ebenezer Thomas:—

4550. You are a member of the Liverpool Trade Association, and you come here to give evidence on their behalf? On behalf of the Liverpool Provision Association and Produce Exchange.

4551. You are engaged yourself in the wholesale trade, but you come here on behalf of the Liverpool Provision Trade Association? Yes.

. . . .

4563. Then, as regards the question of foreign butter, have you any suggestions to make as regards that coming into this country? My association feels that some protection should be extended to the importer of foreign butter as against the fraudulent foreign exporters and shippers. We have had cases in Liverpool where butter has been shipped containing 25 per cent. of water. The importer has no remedy, as he has parted with his money to take up the documents, in exchange for which he has butter which is contrary to the standard of the British law, and he has to sell it the best way he can, without a warranty. Therefore, every foreign country should guarantee the purity of its butter, either by attaching a certificate of analysis to the documents, or by branding every package that is shipped by them. The importer is the responsible individual at the present time; his warranty stands good in the case of any retailer being prosecuted, therefore his position should be very clearly defined.

4564. Cannot you protect yourself by insisting on having a guarantee from the foreign exporter? Even though such warranty may be put on an invoice, the protection it affords is of little or no use, as I cannot ascertain the purity of the goods until I have taken up the documents.

4565. If they are a substantial firm you would have your remedy, would not you? I suppose I have a remedy, but it frequently involves greater expense to enforce that remedy than to face the loss.

. . . .

4603. I understand you to recommend that, although you may be only done once with regard to a fraudulent shipper, Parliament ought to pass a Bill which would compel the foreign importer to give a warranty; is that the case? Parliament should make it illegal to import foreign butter unless guaranteed by the country of origin, or make such provisions as to effectively arrest the importation of adulterated butter, without inflicting an injury on the importer, who buys it in good faith.

Evidence of Mr. Richard Twoomey:—

4604. You are one of the trustees of the Cork Butter Market? Yes.

4605. And also an exporter of every description of Irish butter? Yes.

4606. And are you sole proprietor of a butter factory at Cork? Yes.

4607. And honorary secretary of the Cork Butter Exporters' Association? Yes.

4608. That is a body which handles one-third—one-fourth to one-third—of the entire butter products of Ireland? Yes.

. . . .

4626. Then, as regards butter being imported from abroad, how would you deal with that? I think if you are going to put a lot of restrictions on the home trade you should certainly place greater restrictions on the butter imported from abroad in this way. We think that the Government

of the countries which are sending butter in here should be held responsible for the guarantee.

4627. You think that all butter coming in ought to be guaranteed? Yes, by the respective Governments of the countries they came from.

4628. Do you think there would be no difficulty in that? I think it is a matter for the Government here.

4629. I mean, do you think there would be any difficulty in the trade? I think there should not be any difficulty in the matter. If any cases of adulteration were proved afterwards, the parties here would then be able to obtain redress from the Government of the country from which the butter came.

4630. You think that under the present condition of things they can get no redress? Certainly they cannot.

Evidence of Mr. Bernard Dyer, D.Sc. :—

5024. You are a Doctor of Science, and a Fellow of the Institute of Chemistry? Yes.

5025. And you are a public analyst under the Sale of Food and Drugs Act for the counties of Essex, Leicester, Rutland, and Wilts? Yes.

. . . .

5027. You are familiar with the processes of butter-making, and you have been nominated to give evidence on behalf of the Central Chamber of Agriculture? Yes.

. . . .

5029. Perhaps you will just read them? The council of the Central and Associated Chambers of Agriculture have referred the matter to a committee for consideration, and that committee has presented a report, which, after discussion, has been adopted by the council of the Central and Associated Chambers of Agriculture. That report contains the following recommendations:—1. That inspectors of, or other persons appointed by, the Board of Agriculture should be empowered to enter all premises where butter is made, stored, or manipulated, and to inspect any processes conducted therein. 2. That all such places should be registered as butter factories, and be licensed. 3. That the addition to butter of any fat, other than butter-fat, or of any vegetable oils or other substance capable of being used as an adulterant of butter, be prohibited 4. That it be made illegal to bring into any butter factory any substance capable of being used as an adulterant of butter. 5. That no butter should contain more than 16 per cent. of water. 6. That the importation of butter from any country from which adulterated butter is being exported should be prohibited unless in casks bearing the stamp of the Government of the country of origin, as a guarantee of its purity.

Evidence of Mr. Frederick James Lloyd :—

5287. You represent the Bath and West of England Society? Yes.

5288. And the British Dairy Farmers' Association? Yes.

5289. You are here, we understand, to support resolutions which were passed by the council of the Bath and West of England Society? Yes. Those resolutions, I presume, have been sent to the clerk of the Committee by the secretary of the Bath and West of England Society.

. . . .

5320. Is the preparation of fats to be blended with butter now on the increase? I believe that the preparation of fats specially made to blend with butter, and so made that the butter after being adulterated shall pass the test of the public analyst, has now become a distinct business. These fats go into factories in cases which have no name, very often, perhaps, only a few letters, to indicate their origin; but if the suggestions of the Society were adopted, no such fat would be allowed to enter into a butter factory.

. . . .

5328. And you would recommend such a course to be pursued with regard to butter? Yes.

5329. What would you suggest with regard to imported butter? In the case of butter which is imported, by the adoption of a high standard we should find a large quantity probably which failed to come up to that high standard. That butter should be condemned, unless certified as genuine by the Government or by control stations under Government

supervision, of the exporting country, thus throwing the onus of proof of the genuineness of the butter upon the exporting country, and not giving us the enormous amount of trouble of proving that the butter is adulterated.

These extracts show how wide-awake the people in England are regarding the question of butter substitutes and butter adulteration; and they also clearly demonstrate how strong is the desire on behalf of British importers and others, that all butter sent to England should be guaranteed by the Government of the country exporting the article.

The Commerce Act, recently put into force, to a great extent fills the requirements of British importers; but as it is optional to have goods exported under that Act without any mark or guarantee of purity, there may be trouble, as those factories sending butter to England at the present time without the stamp of the Government of the country of origin, will be in a position somewhat similar to the butter now arriving in London, but which does not bear the stamp of the Dutch Government, and which, as seen by these extracts, is regarded by all traders with suspicion.

I would lay special emphasis on this point, because I think it affects our factories somewhat seriously, and therefore it would be well for them to understand their exact position.

To show that the butter from this State has nothing to fear in the way of excess of water, I might point out that out of samples recently analysed from the factories representing the entire State, the percentage of water was found to be only a little over 13. What is far more than this is the possibility of adulteration with foreign fat, and to show the similarity in analyses of butter and margarine, I give the following figures, which have been handed in as evidence before the Committee referred to:—

COMPARATIVE ANALYSIS of "Le Dansk" brand of Margarine, with that of Finest French Butter.

	"Le Dansk."	Finest French Butter.
Water	12·47	14·00
Fats	85·41	84·00
Caseine	1·59	0·50
Lactic Acid and Salts	0·53	1·50
	100·00	100·00

It will be seen that the constituents are nearly similar in amounts, but the difference between the fat in margarine and that in butter is considerable, because, although they are both fats, the composition of butter-fat differs a good deal from the composition of ordinary animal fat, and this latter is not looked upon as being nearly so desirable a food product as butter.

Butter Blending.

This is of three kinds, viz. :—

1. Butter blended with other butter.
2. Butter blended with milk or water.
3. Butter blended with foreign fats.

All three methods are practised in Europe, and colonial butter is made the basis for all three forms of mixture.

(*To be continued.*)

Dairy Notes.

The following table shows the result of analyses made of samples of Butter manufactured in New South Wales analysed in the Laboratory of the Dairy Branch, Department of Agriculture, in connection with the Commerce Act :—

Laboratory No.	Date received	Percentage of Water.	Laboratory No.	Date received.	Percentage of Water.	Laboratory No.	Date received.	Percentage of Water.
	1906.			1906.			1906.	
1	2 October	12·8	43	8 October	13·4	85	11 October	13·4
2	2 ,, ...	14·4	44	8 ,, ...	14·1	86	11 ,, ...	15·4
3	2 ,, ...	14·5	45	8 ,, ...	14·9	87	11 ,, ...	10·4
4	2 ,, ...	14·4	46	6 ,, ...	14·0	88	11 ,, ...	16·8
5	3 ,, ...	13·1	47	6 ,, ...	12·8	92	10 ,, ...	15·0
6	3 ,, ...	10·1	48	6 ,, ...	12·8	93	10 ,, ...	13·5
7	3 ,, ...	13·0	49	6 ,, ...	15·0	94	10 ,, ...	13·4
8	3 ,, ...	12·3	50	9 ,, ...	14·8	95	10 ,, ...	13·2
9	3 ,, ...	12·0	51	9 ,, ...	16·1	96	11 ,, ...	13·6
10	3 ,, ...	12·9	52	9 ,, ...	14·7	97	11 ,, ...	14·2
11	3 ,, ...	12·5	53	9 ,, ...	14·1	98	10 ,, ...	14·8
12	3 ,, ...	13·9	54	8 ,, ...	14·0	99	11 ,, ...	13·1
13	3 ,, ...	15·2	55	8 ,, ...	14·5	100	11 ,, ...	14·1
14	3 ,, ...	14·0	56	8 ,, ...	14·1	101	11 ,, ...	15·2
15	4 ,, ...	13·7	57	8 ,, ...	13·8	102	12 ,, ...	14·2
16	4 ,, ...	12·9	58	8 ,, ...	14·8	103	12 ,, ...	13·3
17	4 ,, ...	14·3	59	8 ,, ...	13·6	104	12 ,, ...	14·2
18	4 ,, ...	12·6	60	8 ,, ...	14·4	105	12 ,, ...	15·0
19	4 ,, ...	12·2	61	8 ,, ...	12·9	106	13 ,, ...	12·65
20	4 ,, ...	13·7	62	8 ,, ...	12·3	107	13 ,, ...	13·23
21	4 ,, ...	13·7	63	8 ,, ...	13·3	108	15 ,, ...	12·65
22	4 ,, ...	13·7	64	8 ,, ...	13·1	109	15 ,, ...	14·97
23	4 ,, ...	16·3	65	8 ,, ...	13·4	110	15 ,, ...	13·77
24	5 ,, ...	14·2	66	8 ,, ...	12·7	111	16 ,, ...	13·92
25	5 ,, ...	12·7	67	8 ,, ...	15·2	112	16 ,, ...	15·43
26	5 ,, ...	14·6	68	9 ,, ...	11·4	113	16 ,, ...	13·45
27	5 ,, ...	12·8	69	9 ,, ...	13·6	114	16 ,, ...	13·32
28	5 ,, ...	14·8	70	9 ,, ...	13·4	115	16 ,, ...	15·32
29	5 ,, ...	15·3	71	9 ,, ...	13·7	116	16 ,, ...	12·59
30	5 ,, ...	14·0	72	9 ,, ...	13·3	117	17 ,, ...	14·50
32	5 ,, ...	13·0	73	9 ,, ...	15·4	118	17 ,, ...	14·34
33	5 ,, ...	13·7	74	9 ,, ...	13·6	119	17 ,, ...	13·31
34	5 ,, ...	14·2	75	9 ,, ...	12·2	120	18 ,, ...	14·96
35	5 ,, ...	11·3	76	10 ,, ...	14·3	121	18 ,, ...	15·94
36	5 ,, ...	10·2	77	10 ,, ...	13·1	122	20 ,, ...	14·40
37	5 ,, ...	12·9	78	10 ,, ...	14·5	123	19 ,, ...	14·28
38	5 ,, ...	13·5	79	10 ,, ...	16·0	124	19 ,, ...	14·82
39	5 ,, ...	14·1	80	10 ,, ...	14·5	126	20 ,, ...	14·30
40	5 ,, ...	12·7	81	10 ,, ...	14·1	126	18 ,, ...	13·21
41	5 ,, ...	15·2	82	10 ,, ...	13·0			
42	6 ,, ...	14·8	83	10 ,, ...	12·8			

Wheat Growing in the Inverell District.

J. McILVEEN.

UNLIKE many districts in the Commonwealth, Inverell is not dependent on wheat-growing as the only occupation of its farmers. Favoured with rich soil, a good average rainfall, and an excellent climate, other crops, as well as dairying, form important sources of revenue to the man on the land. Wheat-growing has not, therefore, received the study and attention it might otherwise have done. There is no experimental farm at which tests of the most suitable sorts for a general crop might be made. The wheat-grower has had to grope his way along the path of knowledge unaided, except by the casual interchange of personal experiences with his neighbour. The present is the first occasion on which an attempt has been made to invite public discussion on this important question, and it is to be hoped that the start thus made will develop into something of practical and permanent benefit to an important industry. The history of wheat-growing in this district extends back about forty-five years, the first area sown being by Mr. S. Tomlinson, on his farm adjoining Mr. Leslie's on the Auburn Vale road. The yield was an excellent one, and the crop was sold to the late Mr. T Vivers, of King's Plains, at 12s. per bushel. The success of this experiment led others to follow the example thus set, and the results were so good that the late Mr. Colin Ross set about the erection of the mill now occupied by Mr. Howard, and, in addition, introduced a steam threshing machine. The area gradually extended, but for years growers were hampered by the absence of railway communication with outside markets, and, as a matter of fact, when they had an extra good crop they were worse off than when crops were a partial failure, for the reason that the local market could only absorb a limited quantity. The railway has, however, altered all that, and, although it entails freight over the second longest line in the State, the rate is the reasonable one of 14s. 2d. per ton, or about 4½d. per bushel, to the port of Sydney. Of the earlier varieties grown, the most favoured were White Lammas, Golden Drop, Blue Velvet, and Californian Spring. With the exception of the first named, these sorts have almost disappeared, being replaced by Manitoba, Blount's Lambrigg, Purple Straw, Marshall's No. 3, Steinwedel, Bobs, and other well-known varieties. Like the varieties of wheat, the methods of cultivation have also changed, and the single-furrow plough has given place to the gang and disc ploughs, enabling enlarged areas to be sown without much additional labour. It is doubtful, though, if average yields have kept pace with extended areas. In the earlier stages of the district's history, 40 bushels were a common occurrence; now, a ten-bag crop is a matter for wide comment. One reason

for this is not far to seek. The single-furrow man did useful work; the man with the many-furrowed plough, especially the hired man, is apt to miss patches here and there, and also to "run over it," the object not being, with a good many, to cultivate *well*, but to cultivate *much*. The ambition to get in as large a number of acres as possible is a laudable one; but it is a matter for consideration whether a smaller area, well cultivated, would not yield as much or more than a larger area badly tilled. It is also more than probable that constant cropping has, to a great extent, exhausted the lighter soils, and that fertilisers are required to aid in the production of heavy crops. On the heavy black soils, continuous cropping does not appear to have any ill effect. With the least encouragement from a favourable season, wheat on 50-year old paddocks will grow rank, lie down, and tangle up as freely as in paddocks of recent cultivation. There seems no risk of exhaustion of these lands, and the only fertiliser needed can be obtained by the point of the ploughshare.

Methods.

First, the land should be well and deeply ploughed, twice if possible; but one good ploughing in dry weather, especially of black soil, is worth more than two or three if the land is wet. Ploughed dry, when rain comes the soil will slacken like lime, whilst the wet plough takes weeks to dissolve. The disc harrow and the spring-tooth cultivator are valuable aids to the latter-day farmer, but cannot always be used—the first named if the soil be wet, and the latter if there is much rubbish. For cross ploughing there does not appear to be anything superior to the disc plough. Broad-casting the seed is largely the practice as yet, but for economy in sowing, the seed drill, either hoe or disc, is miles ahead of the old system. With the drill there is a saving of at least 50 per cent. in seed, and this is a fact which no wheat-grower to any extent can afford to ignore. The saving thus made will, on an area of 100 acres, pay the cost of the machine in two or three seasons. The saving in labour is also considerable, as no harrowing is required after the drill to cover the seed. Certainly, there will be some trouble with the drill if the weather be wet and the soil sticky; but, if possible, no sowing of any kind should be done if the land is black soil if it is very wet, as it has a tendency to bake with the first spell of dry weather. Better run the risk of a late crop than a poor one from a soured paddock. With late sowing there is one fact that some of our growers seem to forget, and that is, that a much larger quantity of seed is required than for the early seeding, as the plants have not time to stool out. In choice of seed the grower has a wide range of varieties to choose from; but of whichever sort or sorts he elects to sow, he should see that it is carefully graded, perfectly clean, and be well pickled with an effective fungicide—sulphate of copper (bluestone) for preference. There is not enough attention paid to pickling the seed, and the result is that smut is more or less prevalent in parts of the district. An erroneous idea prevails amongst some of our growers

that if seed is free from smut the produce from that seed need not be pickled for two or three seasons, but will remain clean. No greater mistake can be made. Clean seed only should be sown, and that carefully steeped or pickled. There will then be no trouble with smut; but it is doubtful if any amount of pickling will totally destroy all the smut spores in dirty seed. An excellent article on "Wheat Smut and its Prevention" appears in the September issue of the *Agricultural Gazette.* Its careful study by growers troubled with this pest would be to their advantage, as well as in the district's interest. Another pest, the result of sowing impure seed, and which has obtained a tremendous hold throughout the district, is the wild or black oat. Once this gets a good footing in a paddock, it seems to defy all attempts to get rid of it. Extra deep ploughing has been tried with a view to burying it so deeply that it would rot, but if it cannot find its own way to the surface it will wait patiently till a friendly ploughshare comes along and gives it a lift, when it will resume business, although years may have elapsed, as if nothing had happened. To get rid of black oats, it should be given every encouragement to grow, but never allowed to go to seed. Only by keeping the land cultivated and fed off with sheep can the pest be got under. Cropping with maize for a couple of seasons is a good plan; but land between and along the rows must be kept clean with the plough and the hoe. Farmers should refrain from making black oats into hay, and from feeding their horses with its chaff. Just here it may not be out of place to remark that Inverell chaff has got a bad name in outside districts, purely through exporting black oaten chaff. This should not be. The black oat ought to be regarded as a public enemy. At present it is a sort of friend of the farmer, who, if he has a dirty paddock, unfailingly declares his intention of "cutting it for hay." Cutting it for hay does not remedy the evil. The black oat seems to have some idea of what is coming, as it hurries up and sheds its ripe grain long before the neighbouring wheat is fit to cut for hay, and whilst its own stalk is green and succulent. The black and variegated thistle, and a later importation known as "Maypole," are sources of some annoyance to wheat-growers; but their presence in the wheat-field is evidence of slovenly cultivation, or inattention on the part of the owner.

Varieties.

Regarding the varieties most suited to the district, the author's impression is that it is necessary to take into consideration the character of the soil before arriving at a conclusion, as a variety which may thrive on one kind of land will not do so on another, and *vice versâ.* For the present purpose, it should be sufficient if we divide the soils of the district into two classes—black and red. There are several sorts which, in ordinary seasons, do well on both. Prominent amongst these are Blount's Lambrigg and Marshall's No. 3. In wet seasons Manitoba will also succeed on both, but in average years it prefers the black soil. Wheat-growers cannot make much mistake if they confine themselves to these three varieties. I

am not saying, by any means, that there are no other sorts which will give as good yields in seasons suited to their growth, but the uncertainty of the seasons must always be a matter of deep concern to the wheat-grower. When the years are moist, as in 1903, and as 1906 promises to be, and when rust is prevalent, Manitoba is pre-eminent as a reliable crop. When the softer sorts are found to be smothered in rust, the hardy Manitoba will be perfectly clean, and the heads full of plump grain. The other two sorts named have also been found to resist rust well. They likewise give excellent yields in dry seasons. This was well proved last year, as tests made between these varieties and Bobs at Stirling resulted in a return of two bags of each to one of Bobs, off equal and considerable areas. Bobs, a newer sort, may possibly turn the tables this season if it maintains its reputation as a rust-resister. Manitoba has been condemned by some farmers because it shells somewhat easily, and because it does not yield well on red soil. Admitting that both these charges are true, though the trouble in red soil might be got over by the use of fertilisers, it must be borne in mind that in New South Wales few districts produce a Manitoba containing all the properties which make its flour so valuable; that Inverell can and does grow Manitoba to perfection; the average yield compares favourably with other kinds; the higher price it commands more than compensates for any trifling loss from "shelling": that this wheat can be depended upon to give a return in all seasons—except, of course, in absolute drought, and you have a wheat which is easily first as a variety suited to this district.

But no matter which kind is sown, there should be frequent interchange of seed. It is a mistake to sow the same seed year after year. Seed should be procured from other districts, now and again at least, and a change from hillside to plain, and from black soil to red, and *vice versâ*, will be found essential in retaining the good qualities of any variety.

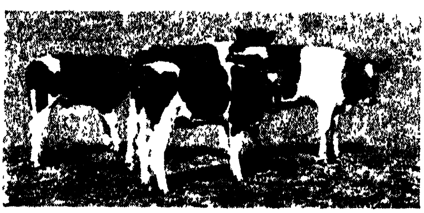
Owing to the strength of the soil, the trouble of rank growth confronts the grower, perhaps, more than in any other district in the State, in drooping seasons. The simplest remedy is, of course, in feeding off with sheep. Sheep are not, however, always available; but, assuming that they are, the grower need not hesitate to feed off closely. He need not fear that his crop will not come again. It takes a lot to stop the growth of wheat. No matter how much it is fed down, it will not lose much time, and at harvest time will only be a couple of weeks or so behind the rest—that is, of course, when it is simply eaten off and the sheep taken out. Even after the stalk is in "shotblade" it is wise to eat off if there is excessive rankness. Better to take the chance of its not coming again than have it rotting on the ground, and a crop so badly tangled that neither binder or any other kind of machine can recover half of it. There is, however, no danger of its not coming again. Few of us have forgotten the frosts of 1899, when wheat in blossom was cut to the ground; yet the growth from the roots was so rapid that there was only about three weeks difference in the ripening of the untouched grain and the second growth.

Harvesting.

The methods of harvesting have been greatly simplified by the introduction of the stripper harvester, and the Inverell growers have not been slow in taking advantage of it. Carefully handled, these machines give excellent results where the grain stands up; but in tangled or lying-down crops, even with the use of falsecombs, there is more or less loss. There is a prejudice against the harvester, on the ground that it "dirties" the land. Used without the "chaff-carrier" there is no doubt it has that objection; but where the carrier is used the harvester is no more objectionable than the ordinary stripper. The objectionable character of all machines of this class is that they cannot be used until the crop is dead ripe. In a district such as Inverell, where thunderstorms are not infrequent during harvest, there is often sudden and serious loss from hail and violent winds when paddocks are left for the stripper. The ideal method of harvesting is, no doubt, the binding of the crop with the string binder. There is scarcely any risk of loss from storms; tangled crops are much more satisfactorily garnered. The grain, when thrashed, is of a better quality than when stripped. The straw, if cut a shade on the green side, makes excellent winter feed for stock, and is invaluable about the farm for covering sheds, topping up haystacks, and also for filling into gullies that are washing away the soil. The cost of this system of harvesting, especially to those growers who have no threshing machinery of their own, is, however, considered so heavy that the great majority prefer the cheap, if risky, plan of stripping, though by so doing they sacrifice their straw, sometimes their grain, and occasionally their cattle. Straw has excellent keeping qualities if decently stacked, and, although in fat years it may pile up about the farm in a manner dismaying to the owner, it is simply putting money in the savings bank. The day will come sooner or later when the bank will repay the principal of the farmers' labour with compound interest. There was such a repayment in 1902, when old stacks that had been neglected for twenty years were convertible into cash at £6 per ton. The individual grower must, however, use his own discretion as to which method he ought to or does adopt, and if by employing the labour-saving harvester he can save as much as enables him to buy fodder for his stock in drought times, or to store up supplies of other feed, such as lucerne hay--the keeping quality of which is undeniable—to meet the inevitable demand, no one can question his right to do so or his wisdom in doing it. The trouble, unfortunately, is that in the good years he is apt to forget the lesson of the drought and neglect the storing up, till suddenly he finds another bad time staring him in the face.

It would not be right to conclude without a few words on wheat-growing as a paying crop or otherwise. It is not my intention to go into figures to show that the average yield is so many bushels; that ploughing costs so much per acre; seed so much; sowing and harrowing so much; and the balance from the sale of the crop the actual profit to the grower. There is

not much satisfaction in doing that. The illustration might not cover 1 per cent. of wheat-growing cases. Besides, figures can be made to prove anything, and averages are often misleading. There are other factors in wheat-growing in this district which have to be taken into consideration. The farmer may be a dairyman, and run his cows on the crop in the earlier stages of its growth, and as a result make a lot of butter; he may turn a part of his crop into hay, and later on turn that into butter also. It will, I think, be admitted that the profits from the butter thus made should be added to those derived from the grain before a balance is struck. Again, he may turn his poddy calves on to the wheat for a spell in the spring, and materially add to their growth; or, if he be a sheep-farmer, in feeding the wheat off, turn a percentage of it into wool and mutton. Inverell is not, in the strict sense of the word, a "wheat" district, although wheat grows to perfection. There are few, if any, farmers who depend solely on wheat. The industry must, therefore be considered in conjunction with other crops and other pursuits. Viewed in this connection, there can be no other conclusion arrived at than that it is a payable crop, with the prices ruling as they do from about 2s. 6d. to 3s. for white wheat, and 3d. to 6d. more for Manitoba.—*Inverell Argus.*



The Poisonous Action of Johnson Grass.[1]

ALBERT C. CRAWFORD.

Bulletin No. 90. Part IV.—Bureau of Plant Industry, United States Department of Mines.

JOHNSON grass, which was introduced from Turkey into this country about 1830,[2] has spread so that in many places it is considered as a weed and pest.[3] Some farmers, however, have utilised the dried grass as hay with advantage, either alone or combined with other food material,[4] and chemical analyses have proved its value as feed. Recently reports have come to this office from California of the death of cattle under such circumstances as to point to Johnson grass as the causative agent—the cattle dying in thirty minutes after eating the grass. Johnson grass belongs to the same genus of the Gramineæ as sorghum This group has been partially investigated chemically, and it has been found that the fresh green plants of various members yield hydrocyanic acid as a result of the action of enzymes on more highly complex bodies.[5]

[1] This office has from time to time received communications from stockmen, especially in the lower part of California, Arizona, and adjacent territory, expressing a suspicion that the eating of Johnson grass had caused the death of stock with rather sudden and violent symptoms. There has seemed to be little ground in poisonous-plant literature to support such an explanation. Last summer, however, convincing observations were reported from California by a stockman who had lost heavily, and a supply of the grass in question was obtained. The result of the study of this material was so positive, and the possibility of damage due to this unsuspected forage plant so clear, that this preliminary notice is put out in the hope of getting observations and material for study from many sources, in order, if possible, to determine the conditions under which the poisonous properties are developed, and over how wide an area they are likely to appear.

RODNEY H. TRUE,
Physiologist.

Office of Poisonous Plant Investigations,
Washington, D.C., December 11, 1905.

[2] Ball, C. R.—Johnson Grass. Bul. No. 11, Bureau of Plant Industry, U.S. Dept of Agriculture, 1902.

[3] Spillman, W. J.—Extermination of Johnson Grass. Bul. No. 72, Part III, Bureau of Plant Industry, U.S. Dept. of Agriculture, 1905.

[4] North Carolina Agr. Expt. Sta. Bul. 97, p. 92.

Vasey, G.—Grasses of the South. Bul. No. 3, Division of Botany, U.S. Dept. of Agriculture, 1887.

Report of the Commissioner of Agriculture for 1881, pp. 231, 232, 239, 241; Report of the Secretary of Agriculture, 1890, p. 381.

[5] Dunstan, W. R., and Henry, T. A.—The Nature and Origin of the Poison of Lotus Arabicus. Phil. Trans. Roy. Soc. London, 1901, vol. 194, B., p. 515.

Dunstan, W. R., and Henry, T. A.—Cyanogenesis in Plants. Phil. Trans. Roy. Soc. London, 1902, vol. 199, A., p. 399.

Slade, Henry B.—Prussic Acid in Sorghum. Jour. Amer. Chem. Soc., 1903, vol. 25, pp. 55–59.

Slade, Henry B.—Study of the Enzymes of Green Sorghum. Fifteenth Ann. Report, Agr. Expt. Sta. of Nebraska, 1902, pp. 55–62.

Brünnich, J. C.—Hydrocyanic Acid in Fodder-plants. Jour. Chem. Soc., 1903, vol. 83, part 2, pp. 788–796.

Bail,[6] in 1902, stated that at that time there had been no official reports to his office of cases of poisoning by Johnson grass, but that there were some newspaper statements to that effect. He thought these accounts were probably not authentic, but stated that "since Johnson grass is closely related to sorghum, which is known to be poisonous under some circumstances, it would not be surprising if Johnson grass should also be poisonous under like conditions. * * * * In comparison with the great number of cattle fed and pastured on Johnson grass, the reported cases of poisoning are extremely rare."

The first report of the poisoning action of Johnson grass which reached the Department came from Miles City, Mont. Mr. William Story reported that he and a neighbour had lost several head of cattle after they had eaten small quantities of the grass, and that they had died very suddenly. Mr. Story suggested that there was "something peculiarly poisonous about the grass." The Commissioner of Agriculture, in publishing this report, stated that "although the grass has been cultivated in the South for forty or fifty years, no similar charges have been made against it."[7]

In India this plant is widely used as a fodder for cattle,[8] and the natives make use of the seeds for food. It has been noted there that deaths in cattle frequently occur when, on account of the failure of rain, the plants which reached a certain size become stunted and withered. The toxic principle appears simultaneously over a wide area, but soon disappears if a rainfall occurs.[9] The deaths of cattle have been attributed by some to an insect living upon the plant, and in Australia it is the belief that *Sorghum vulgare*, which also yields hydrocyanic acid, becomes more poisonous when attacked by an insect during a drought. A similar observation has been made with *Sorghum vulgare* in the Soudan. Balfour[10] found that one specimen of the plant which harboured aphids yielded more hydrocyanic acid than a second one without parasites. Pease has lately claimed that the deaths from Johnson grass in India were really cases of nitrate poisoning, as he found 25 per cent of nitrate of potassium in the stem of the plant, and was able to produce somewhat similar symptoms in animals by feeding them this salt. Johnson grass is being introduced into Australia as a fodder plant, but as yet no reports of its poisonous action there have been noted by the writer.[11]

There has been some chemical study of Johnson grass, but not with reference to any poisonous principle.[12]

[6] *Loc. cit.*, p. 23.
[7] Report of the Commissioner of Agriculture, 1885, p. 74.
[8] Duthie, J. F.—Fodder Grasses of Northern India, 1888, p. 41.
[9] Pease, H. T.—Poisoning of Cattle by Andropogon Sorghum. Jour. Compar. Med. and Vet. Arch., vol. 18, 1897, p. 679. See also Agr. Ledger, 1896, No. 24.
[10] Balfour, Andrew.—Cyanogenesis in *Sorghum vulgare*. First Report, Wellcome Research Laboratory, at Gordon Mem. College, Khartoum, 1904, p. 47.
[11] Maiden, J. H.—Useful Australian Plants. Dept. Agr., New South Wales, Misc. Pub. No. 22, 1896.
[12] Annual Report of the Commissioner of Agriculture, 1878, p. 168.

A fresh, green, mature, non-flowering specimen of Johnson grass, moistened with a little water and preserved with chloroform, was sent from Santa Rosa, Cal., in sealed glass vessels, to this laboratory. This was botanically identified here as Johnson grass. This specimen was not immediately worked up, but remained in the jars for about a month. At that time on opening the jars a marked odour of hydrocyanic acid, together with that of chloroform, was detected. The ground-up plant, with the water in which it came, was distilled, and the distillate was caught in sodium hydrate solution. This distillate, on mixing with ferrous sulphate and acidulation with hydrochloric acid, gave a heavy blue precipitate with ferric chloride. Yellow ammonium sulphide was added to the same filtrate, and the mixture was evaporated to dryness on the bath. The dried residue was then taken in hydrochloric acid water, and on the addition of ferric chloride the fluid gave the characteristic red reaction for hydrocyanic acid. The nitro-prussid, picric acid, and silver nitrate reactions were all positive for hydrocyanic acid. The aqueous fluid in which the plant was shipped was filtered off from the plant and gave on distillation all the above reactions for hydrocyanic acid.

According to our Californian correspondent, this plant is poisonous when grown on irrigated as well as on non-irrigated lands, but especially so when grown on irrigated soil and the growth has become rank.

Recently Dunstan [13] has shown that Lima beans (*Phaseolus lunatus*), which when grown wild in Mauritius yield sufficient hydrocyanic acid to produce poisoning, when cultivated in Burma lose this toxicity almost entirely, although it may return most unexpectedly.[14] He was unable, however, to determine the condition which increased its poisonous properties.

It is interesting to note, besides this production of hydrocyanic acid from complex glucosids, that proteids, when subjected to oxidation under certain conditions, also yield it.[15] In fact, hydrocyanic acid may exist in plants in two forms, either as the acid or as one of its salts, or in the form of complex glucosids.[16] Under the circumstances, the conclusions of Brünnich [17] should be held in mind, viz., that "all fodder plants related to sorghum must be used with discretion in either the green or the dried state, and should not be given in large amounts to animals which have fasted for some time."

In reference to other forage plants, Avery [18] says that "Kaffir-corn leaves also contain this poison, but other forage plants—clover, alfalfa, grasses, and corn—give no test for prussic acid," and Brünnich also found it in Guinea

[13] Dunstan, W. R.—*Phaseolus lunatus*. Agr. Ledger, 1905, No. 2.

[14] Church, A. H.—Food-Grains of India. 1886, p. 155.
Watt, George.—Dictionary of the Economic Products of India, vol. 6, part 1, 1892, p. 187.

[15] Plummer, R. H. A.—The Formation of Prussic Acid by the Oxidation of Albumins. Jour. Physiol., vol. 31, 1904, p. 65; vol. 32, 1904, p. 50.

[16] Les Nouveaux Remèdes, vol. 14, 1898, p. 272.

[17] *Loc. cit.*, p. 792.

[18] Avery, S.—Laboratory Notes on Poison in Sorghum. Jour. Compar. Med. and Vet. Arch., vol. 23, 1902, p. 705.

grass or *Panicum maximum* and *P. muticum.* Many facts have been collected relative to the distribution of hydrocyanic acid in plants, yet its exact significance in their metabolism is unknown.[19] The question as to the relationship of parasites[20] to the production of hydrocyanic acid remains to be solved.

Later investigations will be carried on to determine the nature of this cyanogenetic compound, to determine whether hydrocyanic acid is present in all stages of its growth, but disappears on drying the plant, whether the hydrocyanic acid production occurs under all conditions or only when grown on certain soils, and the amount produced. Hydrocyanic acid will also be looked for in other members of this genus.

[19] Czapek, F.—Biochemie d. Pflanzen, 1905, vol. 2, p. 259.

[20] Literature on some parasites of the sorghum family can be found in Bot. Gaz., vol. 28, 1899, p. 65. Also in Russe, W., Untersuch. u. d. Krank. der Sorghum Hirse, Arb. a. d. biol. Abtheil. f. Land u. Forstw. am kaiserl. Gesundheitsamt, 1904, vol. 4.

The Bee Industry.

ALBERT GALE.

It is not so many decades since it was prophesied that this State, from the great plains to the eastern seaboard would become, in the Mosaic sense of the term, "a land flowing with milk and honey." That prophesy does not appear to be drawing near to its fulfilment. Nay, as time goes on, and the woodman's axe is plied to the root of the trees, it seems that the prophet did not look sufficiently far ahead, otherwise, he would have said a land flowing with milk, but the flowing of the honey would be spasmodic or almost cease. Such would be the reflections of those perusing the figures published concerning the Bee industry from the year 1897 to that of 1906, inclusive. The oscillation in the number of productive hives and the yield of honey has fluctuated in the same ratio. In 1897 there were returned in this State 41,900 hives of bees, of which 9,343 were said to be unproductive. The 32,557 productive hives produced 1,378,039 lb. of honey, an average of 42·3 lb. per hive. The following year (1898) there was an increase of 5,460 productive hives, and the unproductive hives increased by 12,843, much above the ratio of the preceding year. This increase of 5,460 hives, as would be expected, gathered in an increased yield of 498,680 lb. of honey; but the average yield per hive was greater than the previous year by an average of 7·1 lb. From 1897 to 1899 there was a steady increase in the number of productive hives and in the honey yield. In the last-named year (1899) productive hives increased to 51,681, and the production of honey was nearly 3,000,000 lb. From 1899 to the present year there has been a gradual decline, if we except 1905, in the number of productive hives. Thus, in this year, which ended on the 31st of last March, we have only an increased 4,032 hives above that of ten years ago, but the average yield of honey increased by 8 lb. per hive. This increased production of an average of 8 lb. per hive is due to one of two causes: either to the season, or to the increased knowledge in the methods of manipulating the hives, most likely the latter.

Beeswax.—In 1897 the production of beeswax was 31,842 lb., and ten years later it was 39,620 lb., being an increase of 7,778 lb. only.

In the years 1899 and 1905, when the honey yield was, practically speaking, equal, the wax produced in the later year was 5,706 lb. in excess of that of the former; but a quantity of wax comes into the market that is not the product of the beehive, but is obtained from the wild bees in the bush. Most of our settlers save every particle of beeswax for market purposes, knowing, as they do, its value. The honey that is obtained from the same source is used for domestic purposes, and therefore it does not

find its way into the market. Not so the wax. Then, again, the non-productive hives, although they do not produce honey, yield up their empty combs frequently, to be rendered into wax.

In 1902 the quantity of honey produced was 2,259,177 lb., and five years later (to the 31st March, 1906) the product was 1,841,236 lb., being a decrease of 417,941 lb. The average yield during the past five years was 2,217,331 lb.

The season ending 31st March last, the quantity of honey produced was 1,841,236 lb., being 376,095 lb. below the quinquennial average.

The best season during the past ten years that this State has seen for the production of honey was in 1899, when 51,681 hives produced 2,974,830 lb. of honey, and last year was about equal to it when 53,043 hives produced 3,023,468 lb.

There are thousands of pounds of honey that is produced by persons, other than professional beekeepers, that never finds its way into the Statistician's calculations.

The quinquennial (1902-1906) average of honey per hive was 51·2 lb., and the average wholesale price in the Sydney market during the same period was a little over 2¼d., equalling about 10s. per hive. Add to this the average value of the wax per hive during the same period, each hive producing a little over 1 lb., valued at about 1s. 1d. per lb., wholesale price.

In 1900 the total imports of honey into this State were 128,263 lb., valued at £1,818, and the imports for last year (1905) were 201,415 lb., and valued at £1,942. The increase in weight being 73,152 lb., and in value £124.

In 1900 this State exported 97,460 lb. of honey, at a value of £872, and last year (1905) the export was 180,774 lb., valued at £1,701, an increase in weight of 83,314 lb., and in value of £829. The export of honey nearly doubled itself in five years.

The average wholesale price of honey in 1900 was 2¼d., and five years later is had increased only ¼d. per lb.

The quantity of beeswax produced in 1902 was 51,735 lb., and last season 39,620 lb., a decrease of 12,115 lb. The average yield per year for the past five years was 47,352 lb. Therefore, last season's yield was 7,732 lb. below the quinquennial average.

During the last five years the wholesale price of wax has varied from 1s. 0¼d. to 1s. 1½d. per lb.

In 1900 beeswax was imported into this State to the extent of 4,739 lb., valued at £218, but the importation gradually increased till, in 1905, the quantity imported was 13,625 lb., valued at £703, being 8,886 lb. in weight, and £485 in value, over and above the year 1900 importation.

Notwithstanding the quantity of beeswax imported in the past five years, the State was largely exporting during the same period. In 1900 we exported 51,857 lb., which brought £2,597 in to the country; and five years later (1905) the export was 59,613 lb., valued at £3,407. I am not in a position to give the import and export of wax year by year for the

period named above; but taking a reasonable average, we have sent out of this State not less than 55,785 lb. year by year, which has returned annually about £6,000.

During the period dealt with, in both honey and wax, the harvest has been exceedingly fluctuating, oscillating from about £1,250,000 to £3,000,000, and, of course, wax has fluctuated proportionately. The bee industry has not gone on in leaps and bounds. The returns published no doubt are very reliable as far as they go. There are hundreds of persons in the outskirts of towns and in the country who keep a few colonies of bees for their own domestic use that are never noted in any public return, and this kind of bee-keeping is what I have always advocated—" Bee-keeping as an adjunctive rural industry."

This State will take many years to become a great honey-producing country. The clearing of the bush and timber country largely destroys the hopes of professional bee-keepers. The indigenous honey-bearing flora that is destroyed is not replaced by exotics of equal value to the bees. Then again, bush fires and dry seasons are drawbacks that cause bee-keeping to remain almost at a standstill. One of the latest reports that has come to me concerning the destruction of bees, holds the ever-increasing "bunny" as a responsible party. From the Director of Agriculture I have learned that Mr. Wangman, a settler at Pilliga scrub, assured him that the bees are disappearing in that district, consequent on their feeding on phosphorus rabbit baits, which are distributed uncovered, and persons are consequently losing a good deal of their income. So much as £60 per annum has been lost by one person. The material in phosphorus rabbit bait that would attract the bees is the pollard. When the pollen from flowers is scarce, I have known bees to work in a horse's feed-bin gathering up the bran dust as a substitute for pollen. Pea-flour is the best substitute for pollen.

Diseases in Cattle.

[Extract from the Annual Report of the Government Veterinary Surgeon, Mr. Jas. D. Stewart, M.R.C.V.S.]

DURING the year, 115 morbid specimens were examined in the laboratory, but no research work could be undertaken. In previous reports I have drawn attention to the desirability of more complete arrangements being made for the thorough investigation of obscure diseases of stock, and it is hoped that the result of the conference of Government Pathologists and Bacteriologists, held by direction of the Public Service Board during the latter end of the year (1905), will expedite the granting of adequate facilities for carrying out this important duty by the Stock Branch. The number of communications on diseases of stock received was 521.

A number of cattle at the Government Stud Farm, and the Wagga Wagga and Bathurst Experimental Farms, were subjected to the Tuberculin test with very satisfactory results.

With the exception of isolated outbreaks of Pleuro-pneumonia Contagiosa, Blackleg, Anthrax, Tetanus, and Swine Fever, the animal health of the State has been good. Swine fever is not so prevalent as it was the previous year, a fact no doubt due to the supervision of Stock Inspectors compelling more sanitary conditions to be maintained by keepers of pigs. Blackleg has been the cause of mortality in yearling cattle of several dairying districts, and as there is every probability of the disease again manifesting itself during the ensuing year, I have appended a description of this disease for the guidance of stock-owners. This course has also been adopted with respect to Tetanus, owing to the losses that occurred after last shearing and lamb marking. Fortunately both these diseases can be prevented by adopting energetic prophylactic measures as described herewith.

In last year's annual report a hope was expressed that, during the ensuing year, the problems in connection with the elucidation of that mysterious disease known as "Blindness in Western Horses" would receive special attention, but unfortunately the material necessary for the work has not been forthcoming. The specimens of brain, spinal cord, eyes, and peripheral nerves collected during the investigation at Broken Hill have been examined by Dr. Flashman, Government Pathologist of the Lunacy Department, who reported that the lesions observed by him were compatible with the theory that the horses have been poisoned by some plant which they had eaten, and which contains a poison specially harmful to the nervous system. It will be remembered that, as the popular opinion of owners of affected horses was that the disease is due to the "Wild Melon," a quantity of the fruit of this plant was collected and forwarded for chemical examination to Mr. F. B. Guthrie, who, after continued research, succeeded in extracting a certain ingredient which Dr. Chapman, of the Sydney University, experimented with to ascertain its effect on the animal economy. The quantity of the ingredient

extracted by Mr. Guthrie was, however, too small to admit of experiments on large animals being carried out, and unfortunately a further supply of the wild melon fruit has not been procurable at Broken Hill on account of the character of the season. In reply to a request to forward a further supply of the fruit, the Stock Inspector reported: "No wild melon available; no fresh cases of blindness." Every effort will be made to continue the investigation of this disease as soon as opportunity offers.

In September a serious mortality occurred in cattle on a Hunter River station, which proved, on investigation, to be caused by eating a bulbous plant that was subsequently identified by the Government Botanist as the "Cape" or "Poison tulip." A full description of the investigation was published in the *Agricultural Gazette* of October, 1905.

The careless distribution of phosphorus baits to poison rabbits continues to be responsible for occasional losses of stock. Information with respect to phosphorus poison has been furnished in annual reports for 1900 and 1901.

The Disease "Blackleg."

This disease is also commonly known as "Quarter ill." It is caused by a specific micro-organism, and is, therefore, an infectious disease. Once a pasture becomes contaminated, the disease persists there for years. Infection usually occurs through wounds of the skin and mucous membranes.

Inoculation experiments have shown that the period of incubation of "Blackleg" averages about two days. Cattle, sheep, goat, and very occasionally the horse, are affected. Calves under three months, and indigenous cattle over four years, are practically immune. As a rule it is the yearling calves that die of "Blackleg," especially those well forward in condition. The disease runs a rapid course, and usually ends fatally in one and a half to three days. Recovered animals are generally immune to subsequent attacks.

The chief general symptoms are briefly as follows:- Sudden suppression of appetite and rumination, debility, depression, high internal temperature, lameness in one leg—usually a hind leg—accompanied by evident swelling, and a *characteristic crackling on the part being touched.* As the swelling becomes larger, the other symptoms increase in intensity.

On closely examining the swelling of an animal that has died of "Blackleg," the skin covering the affected part is found to be undergoing dry gangrene; *when pressed the swelling crackles,* and on an incision being made into it, the subcutaneous connective tissue is found to be yellow, gelatinous, and infiltrated with blood, and to contain bubbles of gas. The underlying muscles are usually softened, of a dirty brown or even black colour, and the contained blood is of a frothy, tarry condition, with a sickly odour. Besides these local lesions, there is usually a quantity of fluid, often blood-stained, in the abdominal and thoracic cavities. The mucous membrane of the stomach and intestines often become swollen, congested and infiltrated with hæmorrhages, in which case the contents of the bowels are bloody. Unlike the lesions in anthrax, the blood readily coagulates, and the spleen is unchanged in appearance until decomposition sets in.

I know of no curative treatment that is practicable with general success in the herds of this State. Isolated cases do recover under skilled veterinary attention, but treatment for an ordinary herd beast is generally regarded as unprofitable. Recently a proprietary medicine has been placed on the market, for which curative properties are claimed, and the Department is waiting an opportunity to test its value.

Preventive measures are, however, practised with good results. As with all infectious diseases, the first duty of the owner of the affected animals is to report the outbreak immediately to the Inspector of Stock of the district; and after a post-mortem examination has been conducted, to cause the carcase to be consumed by fire. Until a few years ago the usual method of protecting the herd when the disease appeared was to seton in the dew-lap with various medicinal preparations, and to remove the stock to fresh pastures, but in the present knowledge of vaccination this procedure is not now considered necessary. In 1902 I carried out a series of tests by vaccinating with a microbean preparation, and the results were so satisfactory that the use of this method of protecting against "Blackleg" was brought under the notice of stock-owners in the annual report for that year. Since then vaccination has been extensively adopted, with gratifying results. Its success is due to the fact that the materials used contain attenuated micro-organisms of the disease —that is to say, the virulence of the causal agents is weakened by special processes, so that the disease they produce, when introduced into the system, is so modified that the animal usually makes a good and speedy recovery. As a result of this mild attack, the recovered animal acquires a certain degree of immunity to subsequent infection. Consequently, when vaccination is practised it is no longer necessary to remove stock from infected pastures to check the outbreak. Still, with the object of stamping out the disease, it is always advisable, when practicable, to place contaminated paddocks under cultivation.

Tetanus.

Tetanus is also commonly known as "Lockjaw," owing to immobility of the lower jaw being a pronounced symptom of one of its phases. The disease is of an infectious nature, and due to a specific micro-organism—*Bacillus tetani.* It occurs in all domesticated animals and in man. The ox, horse, sheep, and goat are most susceptible. The causal agent usually gains access to the system through a wound, and under its influence certain ptomaines are generated, which possess properties similar to those of strychnine. The period of incubation lasts from one to about twenty-two days, and, as a rule, the shorter the period between infection and the manifestation of symptoms, the more serious and fatal is the phenomenon produced. It is stated that where the period of incubation is one to ten days, only about 3 per cent. recovered; when from ten to twenty-two days, 25 per cent. recovered; and when it exceeds that limit, as high as 50 per cent. may recover. Tetanus is more common in warm than in cold climates.

The most general symptom of tetanus is a continued contraction of the muscles, and particularly those of the head and neck. During the seizure the muscles become hardened and the animal's body "stiffens," while the

countenance assumes an anxious expression. The masticatory muscles are usually more or less completely contracted, so that little or no movement can be executed by the lower jaw. The affected animal is very excitable, and excitement causes exacerbation of the spasms. If the head is forcibly raised, the *Membrana nictitans* (or so-called third eyelid) passes across the eyeball. When the muscles of the legs become affected, the animal stands in a propped-up fashion. The tail is often carried horizontally in the axis of the body, or a little to one side. Respiration is laboured and the pulse rate increased. In sheep, the jaws are often violently closed, and when the animals are in a recumbent position, the legs are spread apart and the neck curved backwards. When affected animals "go down," they struggle violently, and becoming exhausted soon succumb. Other symptoms are noticeable to trained observers, but the foregoing will suffice to indicate the character of this disease.

The treatment of tetanus requires skill and special training. The usual practice is to thoroughly disinfect the wound and administer anodyne medicines, together with an occasional laxative. The patient should be well nursed in a secluded, cool, and darkened place, care being taken to avoid excitement. The food should consist of nourishing fluids, which, in severe cases of "lockjaw," must be given by means of enema, per rectum. There exists an antitetanic serum obtained in a similar manner to that employed for the production of diphtheria antitoxin. There are two preparations manufactured, for which curative and protective properties are claimed. The curative agent is a dry preparation which is dissolved in distilled water at 40 degrees C., and injected intravenously. The second preparation is a solution, and is injected subcutaneously as a prophylactic against tetanus in man and animals. It is largely used in some countries to prevent the disease developing after wounds are inflicted in operations such as castration, docking, &c. Fortunately, tetanus is not so prevalent in this State as to call for the use of this prophylactic to any great extent. The three outbreaks that occurred during the past year would, no doubt, have been prevented had the wounds of the sheep been made with clean instruments, and were properly disinfected immediately after. As previously stated, tetanus is due to wound infection, and any contaminated article or thing that comes in contact with the wound is liable to inoculate it. While the presence of that condition usually described as "dirty" is not essential, it generally obtains. Thus the source of contamination is frequently traceable to dusty yards, filthy floors of shearing sheds (particularly those used at other times for storing skins), soiled hands and clothes of the operator, or to infected instruments. Infection by these channels can be obviated by watering the yards, washing the floors, cleansing clothes and hands with a solution of disinfectant, and sterilising the instruments by plunging them into boiling water for ten minutes. The disinfection of wounds and cuts is always advisable, and there are a grea number of agents to select from. The usual practice of dabbing the wounds with tar often fails owing to the imperfect manner in which it is applied. On occasions when the disease is prevalent, valuable animals may be protected by an injection of antitetanic serum prior to being exposed to infection.

Weather Conditions during November, 1906.

H. A. HUNT,
Acting Meteorologist.

A MONSOONAL disturbance crossed our western border on the evening of the 2nd, and moved rapidly eastwards, causing scattered rainfall over western districts, and more general and consistent rainfall over the eastern half of the State. Excepting occasional showers in coastal parts, fine weather then supervened till the 11th, when another monsoonal disturbance moved over the Darling and controlled weather during the next three days, causing almost general rainfall, associated with thunder, in the State. Before moving off our coastline eastwards on the 14th, it caused unusually boisterous conditions over the State, especially in coastal parts. Between the 17th and 19th a hot wave passed over the State, affecting mainly western districts. As it approached the highlands it suddenly changed to thunder, hail, and violent local squalls, which conditions ruled over eastern districts for twenty-four hours, and isolated thunderstorms occurred in coastal areas, especially extreme north-east and south-east parts, till the 23rd. Finer and more pleasant weather then supervened till the evening of the 26th, when unsettled and showery conditions set in on the coast, and extended over the tablelands to central-western areas. On the following day a cyclonic eye formed over South Australia, and moved in a south-easterly course over Western Victoria, Bass Straits, and Tasmania. Over this course heavy flood rains, accompanied by violent winds, resulted; meanwhile, rainfall was general over the greater part of our State, some good falls being registered, although a considerable disparity occurred in the totals as a result of thunderstorms.

Taking the month as a whole, the rainfall over the State has been of a most beneficial character. Only at stations in farther parts of Western Division, Upper Barwon tributaries, and coastal parts has it been below normal. At some places in Central Division the excess has been very marked; probably the greatest excess was recorded at Nundle, which station had 180 per cent. above normal. Out on the Warrego, Barringun had 85 per cent. above normal. Even in coastal parts, although the falls have generally been below normal, still they have been of a useful character, many of the stations recording 2 inches and over. Wollongong had 391, while Sydney had 412 points.

Comparison with India.

The following statement shows a brief comparison of meteorological conditions over India, together with those in our State, for the month of November :—

	Departure from normal.		General Conditions (referring to State as a whole)
	Pressure	Temperature.	
India	+ ·03	- 1·4	Dry.
Sydney (New South Wales)	·10	- 1·2	Moderately wet.

It will be seen that similar conditions hold for only one element during last month, viz., temperature. Both other elements, *i.e.*, pressure and weather, show opposite values for both these widely separated regions.

Monthly Weather Report.

HAWKESBURY AGRICULTURAL COLLEGE.

Summary for November, 1906.

Air Pressure (Barometer).			Shade Temperature				Air Moisture Saturation = 100.			Evaporation (from Water Surface).			
Lowest.	Highest.	Mean	Lowest	Highest.	Mean.	Mean for 14 years.	Lowest.	Highest.	Mean	Most in a Day.	Total for Month.	Monthly Mean for 8 years.	% of the year's Evaporation.
29·52 3rd	30·28 8, 27.	29·95	36·0 6th.	93·6 22nd.	65·35	68·9	35 5th.	95 28th.	58·8	·401 23rd.	in. 5·952	in. 5·401	12·9

Rainfall (as recorded).											Mean rainfall for 14 years.
Points	3	9½	6	8	57	2	38	34	5	=162¼ points.	
Dates	3	8	12	13	14	15	27	28	29		207 points.

	N	NE	SE	S	SW	W	NW
Wind ...	9	7	1	8	7	2	4

Thunderstorms on dates—13th and 19th.

Greatest daily range of temperature, 44·5 on 22nd.

Days on which temperature rose above 90°—93 on 18th, 93·6° on 22nd.

Remarks :—A slight frost occurred on 6th, the latest frost recorded previously being on 1st November 1905. A cool, dry month.

The rainfall is again much below the monthly average. The total rainfall for the eleven months ending 30th November is 16·12 inches; the average annual total for 25 years being 31·36 inches. The lowest annual rainfall recorded is 19·15 inches in 1902, so that the present year promises to be a record dry one.

W. MERVYN CARNE,
Observer.

Orchard Notes.

W. J. ALLEN.

January.

This has been a particularly favourable season for fruit-trees, consequently they have put on good growth. The apple, prune, sultana, and grape crops promise well, and the yield should be the greatest we have had for years. Cherries have carried heavy crops, but were a little below the average in size and quality, and the late rains and birds have destroyed a good many of the earlier varieties in places.

At Wagga, the harvesting of the loquats was only completed about the 8th December, and the crop and quality, as well as the prices obtained, were all that could be desired.

Apricot drying will be completed this month, and as the crop in this country, as well as in America, is below the average, growers should see that every pound of fruit is made use of. At time of writing, dried apricots are very high—9d. and 10d. per lb. wholesale, according to quality, with very little chance of their cheapening very much.

The sultana and raisin crop promise to ripen very late this year, and it therefore behoves growers of these fruits to make arrangements for plenty of trays for drying purposes, as, in order to facilitate the drying of same in the cool weather, the trays must not at most carry more than 12 lb. of fruit, otherwise they will dry slowly. Dried peaches and pears will also sell well, as the American stock is very limited, and the prices for same are high. Bartlett pears dry well if allowed to become thoroughly ripe, when they should be cut in halves, submitted to sulphur fumes for a short time, then placed in an evaporator or in the hot sun. Trays should be stacked up in damp and wet weather.

Keep a strict watch for either fruit fly or codling moth. Pick up and destroy all moth-infected windfalls, and do all that is possible to prevent the spread of these very troublesome pests.

Mr. G. A. Pearce, of Seven Hills, has been very successful in dealing with mussel scale by means of crude petroleum spray, and has forwarded me his formula for inclusion in these Notes, which is as follows :—

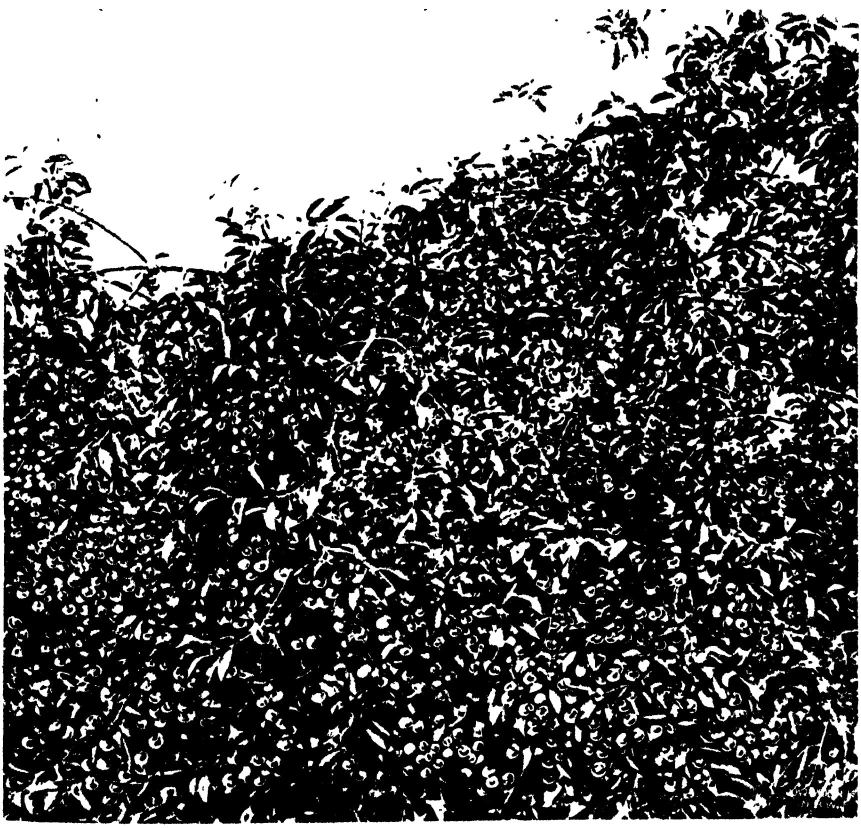
> Crude Petroleum Spray for Mussel Scale.—1 gal. water; 1 lb. of soap (any soap); boil until soap is dissolved and then add 1 gal. crude petroleum, churn thoroughly, then add 8 to 10 gal. of water, which should be warmed on a cold day, otherwise it may set into a jelly. Use when trees are dormant.

If at any time any of our growers are enabled, by experimenting or otherwise, to give reliable information as to their success in fighting one

or other of our orchard pests with any particular spray, I would be pleased to hear from them, and with their permission I would publish such information in my Monthly Notes.

Keep all orchards and vineyards well cultivated and free from weeds, as we cannot afford to rob the trees and vines of one drop of moisture at this season of the year, else the crops may suffer in consequence.

Do not fail to order vetches, peas, rape seed, or whatever crop it is intended to sow for green manure among the trees, as early as possible,



Montmorency Cherry.

One of our best jam-making varieties. It bears regularly heavy crops of medium-sized cherries, which are juicy, and the stones are easily removed.

as such crops should be sown early in March without fail, in order that they may put in good growth before being turned under, and before the rains have ceased to fall in the spring. There are many orchards which could be made more productive if the owners would only give a little more attention to the proper manuring and working of same.

The following is a list of the prices ruling for fruits, nuts, &c., in Seattle, 11th October, 1906:—

Deciduous and Citrus Fruits.

Bananas.—$2.50 to $3.50.

Apples.—Washington Wealthys, Fancy Gravensteins, Red Junes, and Kings, $1.25 to $1.50; Northern Spy, Winesap, Baldwin, and Jonathan, $1.50 to $1.75; Crabapples, 75c. per box; local apples, all varieties, 70c. to $1 per box.

Pears.—All late varieties, $1 to $1.50.

Peaches.—Wonatchee and Yakina Salways, $1 to $1.15 per box; white peaches, 65c. to 75c.

Grapes.—Tokays, $1.25 per box; Blacks, $1 to $1.25; White Muscats, $1 to $1.25.

Citrus Fruits.—Lemons, fancy, $8 per box; oranges, Valencias, fancy, $5 to $5.50 per box; Mediterranean Sweets, $3.75 to $4.25 per box; grape fruit, $4 to $4.50; limes, $8 to $9.

Italian prunes, 60c. to 75c. per box.

Pineapples.—Florida, $4.50 per case; Hawaiian, $3 per doz.

Cranberries.—Cape Cod, $9.50 per bbl., $3.50 per box.

Figs (dried).—California Blacks, in sacks, 6c. per lb.; Whites, 10-lb. boxes, 75c.; 25-lb. boxes, $1.75.

Honey, $3.50 per 24-lb. box.

Nuts.—Cocoanuts, 80c. to 90c. per doz., Virginia peanuts, 6½c. to 7c. per lb.; Old English walnuts, 17c. per lb., Brazil nuts, 15c. per lb.

New York Commercial's latest apple quotations (per bbl.).—Baldwin, $1.50 to $2.25; Ben Davis, $1.50 to $2.25; Jonathan, $2.50 to $4.50; Pippin, $2.25 to $2.75; Gravenstein, $2.25 to $3.25; Openheads, $1.25 to $2; ordinary, $1.50 to $2; Blush, $2.25 to $2.75; Wealthy, $2.50 to $3.50; Codling, $1.50 to $2; Greening, $1.50 to $2.25; Crab, $2 to $3.25; Alexander, $2.50 to $3.50; King, $2 to $2.75.

The boxes for citrus fruit hold 2 cubic feet, and the soft fruit boxes generally 1 bushel.

Practical Vegetable and Flower Growing.

W. S. CAMPBELL.

Directions for the Month of January.

Vegetables.

The chances are that we may have some dry weather this month, although the season has been generally satisfactory so far, and there has been sufficient rain for garden needs If abundance of cow, horse, and sheep dung be used, the effects of dry weather may be minimised, for a large application of vegetable matter will assist to keep the soil moist even in very dry weather. The use of artificial manures tends to dry the soil, except, perhaps, nitrate of soda; but, of course, the application of this alone would not be sufficient on most soils.

The collection of abundance of farmyard dung for all the needs of the vegetable garden should be an easy matter on a farm for digging into the ground, and also for use as a mulch on the surface. All this kind of manure should be well rotted before use, for not only are its valuable manurial constituents made immediately available for the vegetables to feed upon, but many, if not most, of the weed seeds which are sure to be present, will be destroyed.

Probably there are many kinds of vegetables, such as beans, peas, old tomatoes, &c., by this time past bearing and of no further use, unless seeds are required, but it is not good economy to retain seeds of old, almost exhausted plants. A few plants should be set apart for the purpose and kept for seed production only, bearing in mind that many kinds of vegetables will become crossed, and, therefore, the seeds will be unreliable and not true to variety, if various kinds grow close together. Tomatoes are very liable to be crossed by visiting insects. To ensure true seed, the different varieties should be kept as far apart as possible, and certain flowers be protected and pollenated by their own pollen.

The planting of potatoes will be a matter for consideration during the month, according to climate, for it may be altogether too early in some districts. There seems to be a considerable amount of uncertainty as to varieties—that is, as to their proper names—and there is very good reason to think that in some districts varieties have become seriously muddled up, and wrong kinds are distributed. A mistake is not infrequently made in the well-known Early Rose. Many specimens come to the Department named "Early Rose" which are not Early Rose at all, and it is the same with other varieties. Mr. Dunnicliff, of the Department, is taking a great deal of trouble to put things straight, and he has

now in hand a great many varieties on trial, and I have no doubt he will succeed in arranging their proper names, and I hope that before very long all our experimental farms will be provided with increased stocks for distribution.

Beans.—All sorts of the Kidney or French beans may be sown as extensively as may be necessary; but let each bean have sufficient space in which its roots can extend. Very often the seed is sown so close together that the plants are cramped up, and they have no chance to grow as well as they should. Some kinds are better, and succeed infinitely better than others; therefore, it is always advisable to experiment with several varieties, both of dwarf-growing kinds and of runners. As an all-round variety Canadian Wonder stands out well. Of the Butter beans, Anderson's Wonder is worth a trial. Of green runners, the best I have ever grown is Carter's Jubilee, a very large, very tender, and good flavoured bean; but whether it will succeed in other localities I do not know at present.

Broccoli.—A little seed may be sown during the month, and when the seedlings are strong enough to shift, prick them out about 6 inches or so apart, and they may be planted out when well grown. Use manure liberally for broccoli, and endeavour to grow it without a check.

Borecole or Kale.—This vegetable is worth a trial, and is best suited for the cool districts of the State. This, like all other members of the cabbage family, needs rich soil, and a mistake cannot be made in the use of abundance of manure—that is, farmyard manure. Make a start by sowing a little seed.

Cabbage.—Sow seed occasionally during the month, but only sufficient to keep up a supply of plants. Any good strong young cabbages on hand which are large enough should be planted out. Use abundance of manure.

Cauliflowers.—Manage this as advised for broccoli, for it is much the same kind of vegetable. Obtain the very best seed procurable.

Cucumber.—Seed may be sown if necessary.

Celery.—Sow a little seed and plant out any well grown pricked out seedlings which are large enough. Use manure liberally for celery, and if the weather is dry, watering will probably be necessary, for celery needs a great deal of moisture. Earth up well-grown plants, in order to blanch or whiten their thin leaf stalks.

Cress and Mustard.—Sow a little seed now and then during the month. If the weather should be dry, a good deal of watering may be necessary to grow these salad plants during the summer. A very small bed should suffice for each sowing.

Egg Plant.—Probably a sufficient number of plants are growing to meet all requirements; but, if not, seeds may be sown, and the seedlings, when strong enough, should be planted about 2 feet, or more, apart.

Maize (Sweet).—Cultivate growing plants frequently—not deep, but quite shallow—and keep down all weeds. A sowing may be made if more of this vegetable is required.

Onion.—This excellent vegetable should always be grown where possible, and it is in but few places that onions cannot be raised. A few seeds may be sown if more onions are required. Make the surface soil as fine as possible before the seed is sown, and then sow the seed quite shallow in rows. The best way to manage, if very large quantities are not required, is to sow in small well-made beds, and when the young onion plants are large enough they may be transplanted to the main bed. Water well before and after planting. Use abundance of manure, and work it well with the soil.

Parsley.—This herb should always be grown, if only a plant or two. One well grown plant will produce a very considerable quantity of leaves if they be judiciously picked.

Peas.—If the ground be moist and the season favourable, seed may be sown; but in a dry locality it is not worth while risking a sowing.

Potato.—Plant out a few rows of a good variety. Some persons prefer waxy kinds, others floury or mealy potatoes. The kidney varieties have a tendency to be waxy, and it has been said that they are the most wholesome. Select clean seed, and have nothing to do with any showing scab. Plant in rows about 2 feet 6 inches apart, and drop the potatoes about a foot apart. If the soil is well drained, as it should be, plant about 6 or even 7 inches deep. If badly drained plant quite shallow.

Pumpkins.—These should be growing well by this time, and probably there will be sufficient for all requirements; but, if not, seed may be sown at any time during the month.

Radish.—Sow seed from time to time during the month.

Spinach.—Sow a little seed occasionally.

Tomato.—Seed may be sown if more plants are required. If any old plants which have spread over the ground are half rotten, or their leaves are decaying and the condition is a general mess, remove the lot, for the fruit is not likely to be of much, if any, good, and if allowed to remain the plants will probably become diseased with fungus pests; therefore, they are better away from the garden. It is an easy matter to train tomato plants, and when well trained the fruit is likely to be of good quality, and diseases are not likely to be so prevalent as when the tomatoes are growing wild.

Flowers.

Anyone interested in budding roses may be able to experiment this month, provided there is sufficient rain to cause free growth in the stocks whereby the bark rises easily. A little practice is necessary to cut out

the wood eyes of the scion neatly, so that as much as possible of the inner layer of bark may be exposed, so that it can come in contact with the inner bark of the stock. Insert the wood bud in the shady side of the stock and protect with a little cotton, or moss, or something of that sort, so as to keep the bud and budded portion of stock rather moist. Otherwise, if dry weather sets in, the bud may shrivel up before a union is effected.

The spring flowering bulbs have gone to rest by this time, and their leaves have all withered away, leaving no trace of the bulbs on the surface, and unless their localities are known they may be dug into and spoiled. The safest way is to take them up and replant in early spring, and if this be not done every year it should be done occasionally, in order to thin out the bulbs, or else the clumps become too thick altogether. Dahlias of all sorts should be in good flower by this time, and the plants will bloom well into the autumn if the flower-bearing branches are pruned as soon as the flowers die away.

During the month, roses that have been grown in pots may be planted—not old pot-bound stuff, but good young plants. If they are watered now and then, and are well looked after, they should grow into very satisfactory plants during the remainder of the summer and autumn.

Farm Notes.

HAWKESBURY DISTRICT—JANUARY, 1907.

H. W. POTTS

THE outlook for the remainder of the summer and for winter feed is most discouraging. The crops are stunted, and will require unremitting attention to secure even a low yield. The driest season on record is the outcome of inquiry among the oldest inhabitants.

Maize.—The early maize crops have burst into tassel at only half their normal height. The grain crop will be very light. All the crops on the highlands will have to be eaten as green fodder or converted into ensilage. The crops on the farms adjoining the river require constant cultivation to conserve what little moisture exists in the soil; our only hope is from thunderstorms. Advantage should be taken of any falls of rain this month to continue sowings of maize to provide ensilage at the end of the season. Red Hogan, Pride of the North, Hickory King, and Early Mastodon are quickly maturing varieties, and should be sown thickly.

Sorghums.—The crops above ground require as much attention as that devoted to maize. Shallow cultivation to keep down weeds and retain the moisture must be followed up energetically. Further sowings may be made of Early Amber and Planters' Friend for green food for the early months of winter.

Millets.—Should sufficient rain fall to secure germination of the seed, it will be opportune to put in further sowings of Hungarian Millet.

Potatoes.—Towards the end of the month land may be prepared for the next crop of potatoes.

Sweet Potatoes.—The planting of this very useful tuber may be continued.

Swedes and Mangolds.—After thorough cultivation the first sowings may be made towards the end of the month.

Near the end of the month land should be prepared for the early winter fodder crops, such as Skinless Barley, Cape Barley, and Algerian Oats.

Glen Innes District—January, 1907.

R. H. GENNYS.

Maize, sorghums, millets, can still be sown for autumn green feed or for silage. An early sowing of barley could also be made for cutting, and then be allowed to make a second growth.

If potatoes are put in, they should be only very quickly maturing varieties, such as Early Rose.

Sowing of Swedes, turnips, may commence, and of beans, cabbages and cauliflowers continued.

Harvesting of the grain crops will be proceeding, as there is a big proportion of late crops this season. As the paddocks are cleared of crop, sheep should be turned in to clean up all weeds, &c.

During the busy harvest, the summer crops, such as maize, potatoes, &c., are apt to be neglected; but all available time should be given to them in the way of cultivation, stirring up the soil after rain to conserve the moisture and to keep down the weeds.

So far, the frequent thunder-showers have benefited the growing crops, though they have somewhat interfered with harvesting.

Crown Lands of New South Wales.

The following areas will be available for selection on and after the dates mentioned:—

For Conditional Purchase Lease—(Available under Section 10 of Act of 1905. Regulations 356 to 365. Applications to be made on Form No. 114).

C.P.L. No.	Name of Land District	Total Area.	No. of Blocks	Area of Blocks.	Distance in Miles from nearest Railway Station or Town.	Annual Rental per Block.	Date available.
		acres.		acres.		£ s. d.	1907.
44	Armidale ..	..	1	2,000	Uralla, 30 miles; Armidale, 45 miles.	33 6 8	31 Jan.

Thick and open forest country, rough, broken, hilly, and undulating, rocky in places: granite formation; poor sandy soil, not suitable for cultivation; timbered with stringybark, ironbark, gum, box, apple, messmate, peppermint, and pine: very poor to very fair grazing land; breeding country suitable for sheep and cattle: present carrying capacity 1 sheep to 4 acres, or 1 head of large stock to 20 acres, improvable at a cost of about £640 to 1 sheep to 2½ acres, or 1 head of large stock to 12½ acres. Average annual rainfall at Uralla, 19·80 inches. Permanent water in Mulueriudie River.

C.P.L. No.	Name of Land District	Total Area.	No. of Blocks	Area of Blocks.	Distance in Miles from nearest Railway Station or Town.	Annual Rental per Block.	Date available.
45	Dubbo	3,763	5	545¼ to 1,076	Dubbo, 5 to 30 miles	13 12 10 to 35 17 4	1907. 24 Jan.

The area consists of undulating country, sandy, gravelly, and stony in places; sedimentary formation, with red sandy soil and subsoil of clay, sand, and stone, timbered with pine, gum, oak, stringybark, and box; about 2,300 acres agricultural land.

For Original Homestead Selection only—(Available under Section 14 of Act of 1895. Regulations 49 to 58A. Applications to be made on Form No. 7).

H.S. No.	Name of Land District.	Total Area.	No. of Blocks.	Area of Blocks.	Distance in Miles from nearest Railway Station or Town.	Annual Rent per Block.	Date available.
		acres.		acres.		£ s. d.	1907.
1,004	Dubbo	459¼	2	269 and 190¼	Geurie, 1½ miles ...	10 1 10 and 7 3 0 respectively.	24 Jan.

The block of 269 acres is described as undulating and hilly country, gravelly and stony in parts; partly volcanic and partly sandstone formation; timbered with box, pine, and currajong in all stages of growth.

The block of 190¼ acres consists of undulating country, stony in places, with red soil and subsoil of clay and stone; limestone and sedimentary formation; timbered with box, pine, and currajong.

H.S. No.	Name of Land District.	Total Area.	No. of Blocks.	Area of Blocks.	Distance in Miles from nearest Railway Station or Town.	Annual Rent per Block.	Date available.
1,0 7	Dubbo ...	... 177a. 1r. 10p.	5	29a. 2r. 30p. to 43a. 1r.	Within the suburban boundaries of village of Dandaloo, and about 26 miles from Trangie Railway Station.	1 2 4 to 1 12 6	1907. 24 Jan.

The greater part consists of plain, level country, sedimentary formation, red soil and subsoil of clay. No natural water supply; but fair facilities for the storage of water.

For Original Settlement Lease only—(Available under Section 25 of Act of 1895, Regulations 148 to 157D. Applications to be made on Form No. 50).

S.L. No.	Name of Land District.	Total Area.	No. of Farms.	Area of Farms.	Distance in Miles from nearest Railway Station or Town.	Annual Rental per Block.	Date available.
		acres.		acres.		£ s. d.	1907.
847	Dubbo	3,945¾	2	1,962 and 1,983¾	Balladoran Railway Station, 20 and 21 miles respectively. Dubbo, 38 and 37 miles respectively.	40 17 6 and 41 6 8 respectively.	24 Jan.
846	Nyngan ..	12,530	2	6,270 and 6,260	Coolabah Railway Station, 22 and 23 miles respectively.	52 5 0 and 52 3 4 respectively.	17 Jan.

The farm of 1,962 acres is described as slightly undulating country, sedimentary formation; red, reddish, and red sandy soil, clay subsoil; all agricultural land; about 1,142 acres thick forest of box, pine, mutherimbong, gum, budtha, belar, wilga, and oak; about 820 acres open forest of box, budtha, belar, myall, and rosewood; about 950 acres budtha, belar, pine, mutherimbong, and oak scrub. No natural water supply; fair facilities for conservation.

The farm of 1,983¾ acres consists of level and slightly undulating, sedimentary formation; red, reddish, red sandy and black soil; subsoil, clay; all agricultural land; about 1,240 acres thick forest, box, pine, oak, budtha, belar, and wilga; about 480 acres plain, with light myall and box; about 300 acres budtha, belar, pine, and oak scrub. No natural water supply; fair facilities for conservation.

The farm of 6,270 acres is described as principally level, with some low red gravelly ridges; about 750 acres red gravelly soil; remainder good red loam or a black soil; clayey subsoil; about 400 acres fairly open plain; 4,320 acres fairly open forest, and 1,550 acres very thick forest of box, budtha, and wilga, with thick growth of suckers; suited only for grazing. No natural water supply. Good sites for tanks.

The farm of 6,260 acres consists of level country; good red loam or a black soil; clayey subsoil; about 3,470 acres fairly open plain; 2,800 acres fairly open forest of box, budtha, wilga, and belar; suited only for grazing. Water in Bogan River permanent in ordinary seasons.

For Original Conditional Purchase Only.—(Classified under Subsection 1 (A), Section 4, of Crown Lands Amendment Act, 1905.) Available under Section 26 of Act of 1884. Regulations 74 to 130. Application and declaration to be made on Forms 21 and 22.

Name of Land District.	Name of Holding, &c.	Parish.	County.	Total Area.	Price per Acre.	Date available.
				a. r. p.	£ s. d.	1907.
Casino .. .	....	Runnymede	Rous	119 3 0	4 0 0	31 Jan.
Being portions 133 and 134; good grazing land.						
Cootamundra*	Cootamundra Population Area	Cootamundry	Harden	68 2 0	1 15 0	17 Jan.
Being portion 256; suitable for grazing and agriculture.						
Gunnedah* ..	Curlewis Suburban Lands.	Curlewis	Pottinger	30 0 0	5 0 0 to 12 0 0	17 Jan.
Being portions 154 to 158; residential area.						
Gunnedah* .	Curlewis Suburban Lands.	Curlewis	Pottinger	65 2 20	3 10 0 to 4 10 0	24 Jan.
Being portions 159 to 161; residential areas.						
Molong* .	Molong Population Area and Suburban Lands.	Bell	Ashburnham	331 2 0	2 0 0 and 2 5 0	7 Feb.
Being portions 160 to 164; good grazing land, parts suitable for cultivation.						
Murwillumbah*	Mullumbimby Suburban Lands.	Billinudgel	Rous . .	6 1 0	20 0 0	17 Jan.
Being portion 235, on the Brunswick River; suitable for a market garden.						
Muswellbrook ..	....	Carool	Hunter	70 0 0	1 10 0	14 Feb.
Suitable for grazing and agriculture.						
Muswellbrook ..	....	Mediwah	Hunter ..	63 0 0	1 10 0	14 Feb.
Suitable for dairying and agriculture.						
Port Macquarie	....	Redbank	Macquarie ..	59 0 0	1 10 0	17 Jan.
Being portion 69, on the Pappinbarra Creek; suitable for grazing and agriculture.						
Singleton ..	....	Cosgrove	Northumberland.	40 0 0	1 0 0	17 Jan.
Being portion 10, on Yokey Creek; suitable for grazing.						

* Identical with Special Area, see p. 99.

For Original Conditional Purchase and Conditional Lease in virtue thereof.—(Classified under Subsection 1 (b), Section 4, of Crown Lands Amendment Act of 1905); available under Section 26 and 48 of Act of 1884. Regulations 74 to 130. Application and declaration for Original Conditional Purchase to be made on Forms 21 and 22, and for Conditional Lease on Forms 95 and 96.

Name of Land District.	Name of Holding, &c.	Parish.	County.	Total Area.	Price per Acre.	Date available.
				a. r. p.	£ s. d.	1907.
Albury ..	Four-mile Creek ..	Murray ..	Goulburn ..	120 0 0	1 5 0	7 Feb.
		Suitable for grazing.				
Barmedman ..	....	Mandamah ..	Bourke .	570 0 0	1 0 0	21 Feb.
		Suitable for grazing and agriculture.				
Carcoar ..	....	Glengarry & Keverstone.	Georgiana .	720 0 0	1 0 0	7 Feb.
		On the Lachlan River; suitable for grazing.				
Coonamble .	..... .	Youlbung ..	Gowen .	150 0 0	1 2 6	17 Jan.
		On Tooraweena Creek; suitable for grazing and agriculture.				
Gundagai ..	....	Mundalo ..	Wynyard ..	301 0 0	2 0 0	7 Feb.
		Being portion 27; good grazing land; parts suitable for agriculture.				
Molong ..	Ganoo Holding ..	Ganoo ..	Gordon .	860 0 0	1 10 0	21 Feb.
		Good grazing land.				
Picton ..	......	Couridjah ..	Camden ..	633 1 0	0 10 0	17 Jan.
		Being portion 46; suitable for grazing; part suitable for fruit-growing				
Scone .	.....	Terell .	Brisbane ..	275 0	1 5 0	21 Feb.
		On Beat's Creek; suitable for grazing and agriculture.				
Tenterfield .	....	Timbarra ..	Clive ..	3,380 0 0	0 13 4	10 Jan.
		Suitable for grazing.				
Tenterfield ..	....	Bookookoorara	Buller .	1,600 0 0	0 13 4	21 Feb.
		Suitable for grazing.				

Conditional Purchase (Original or Additional) or Conditional Lease.—**(Available by revocation of reserves, and not classified or specially set apart under Section 4 of the Crown Lands Amendment Act of 1905.) Available under Sections 26, 42, and 48 of Act of 1884. Regulations 74 to 130. Application and declaration for Original Conditional Purchase to be made on Forms 21 and 22, and for Additional Conditional Purchase or Conditional Lease on Forms 95 and 96.**

Name of Land District.	Name of Holding, &c.	Parish.	County.	Total Area.	Price per Acre.	Date available.
				a. r. p.	£ s. d.	1907.
Bingara ..	....	Pringle and Rusden	Murchison .	4,400 0 0	1 0 0	24 Jan.
Picton .	....	Merlin	Westmoreland	5,680 0 0	1 0 0	21 Feb.
		Being portions 4 and 6, suitable for grazing.				
Port Macquarie .	......	Redbank ..	Macquarie .	200 0 0	1 0 0	14 Feb.
		On Naret and Stony Creeks.				
Windsor..	.....	Putty ..	Hunter .	640 0 0	1 0 0	14 Feb.
		At Burrowell.				

Special Areas.

Cootamundra Land District, within Cootamundra Population Area, 68½ acres, being portion 256, parish of Cootamundry, county of Harden; maximum and minimum areas 68½ acres, suitable for grazing and agriculture; price £1 15s per acre. Available for original applications only on 17th January, 1907.

Gunnedah Land District, within Curlewis suburban lands, 30 acres, being portions 154 to 158, parish of Curlewis, county of Pottinger; maximum area 7 acres, minimum area 4¾ acres, residential areas; price £5 to £12 per acre. Available for original applications only on 17th January, 1907.

Gunnedah Land District, within Curlewis Suburban Lands, 65 acres 2 roods 20 perches, being portions 159 to 161, and 163, parish of Curlewis, county of Pottinger; maximum area 20 acres, minimum area 14 acres, residential areas; price £3 10s. to £4 10s. per acre. Available for original applications only on 24th January, 1907.

Murwillumbah Land District, within Mullumbimby Suburban Lands, 6¼ acres, being portion 235, parish of Billinudgel, county of Rous; maximum and minimum areas 6¼ acres, suitable for a market garden; price £20 per acre. Available for original application only on 17th January, 1907.

Molong Land District, within Molong Population Area and Suburban Lands, 331¼ acres, being portions 160 to 164, parish of Bell, county of Ashburnham; maximum area 100¾ acres, minimum area 38 acres; good grazing land, parts suitable for cultivation; price £2 and £2 5s. per acre. Available for original conditional purchase only on 7th January, 1907.

For Improvement Lease—(Available under Section 26 of Act of 1895. Regulations 157E to 160 and 250 to 262A. If not bid for at auction may be subsequently applied for on Form 91).

Block Numbers.	Land District or Place of Sale.	Name of Holding.	Total Area.	No. of Blocks.	Area of Blocks.	Upset Annual Rental per Block.	Date of Sale or Tender.
					EASTERN DIVISION.		
					acres.	£ s. d.	1907.
643	Carcoar	....	......	1	1,300 ex road, freehold and residential lease.	12 3 9	21 Jan.

Mountainous and hilly; slate formation: part alluvial near centre; soil generally more or less stony and gravelly; good depth for grass; good soil on alluvial part; timber, thick to open forest of brittle gum, apple, stringybark, yellow box, and white gum. About half the area is well grassed, remainder badly grassed. Permanent water in Tuena Creek, also fair supply in watercourses within the area. Average annual rainfall about 24 inches Rabbits exist. Situated about 7 miles southerly from Tuena, about 5 miles south-westerly from Cordillera, and about 14 miles north-westerly from Binda.

636 and 637	Inverell	Frazer's Creek and Wallangra.	....	2	9,200 and 9,600 (residential lease.)	4 15 10 and 5 0 0 respectively.	7 Jan.

Generally rough mountainous country, very steep and precipitous in places; sandy soil of granite formation; stony and rocky, and with granite boulders in places; timbered with ironbark, gum, pine, and tea-tree, very dense in places, but small patches of fairly open country can be found on the frontages; patches of prickly pear also exist on the land. Permanent and sufficient water supply in Severn and Macintyre Rivers. Average annual rainfall, about 31 inches. Dingoes, hares, and rabbits exist on the land. Situated about 16 miles south-westerly from Bonshaw, about 12 miles northerly from Ashford, and about 20 miles south-easterly from Yetman.

495	Tamworth .. .	Ironbark Creek and North.	.....	1	2,100	26 5 0	21 Jan.

From undulating to rough and steep country; thickly timbered with box, ironbark, apple, gum, stringybark, and cherry-tree, with patches of hopbush, old-man, cherry-tree, stringybark, ironbark, and box scrub. No water supply. Rainfall, about 30 inches per annum. No rabbits, but wallabies are numerous. Situated about 8 miles north-easterly from town of Barraba, and about 28 miles northerly from Manilla railway station.

642	Tenterfield . ..	Barraba, Cheviot Hills North, and Callanyn.	. . .	1	15,000	62 10 0	7 Jan.

Flat to undulating, broken and wild mountainous country, cliffy and inaccessible in parts; about 12,000 acres thick forest country, the remainder open forest; timbered with oak, gum, apple, swamp-oak, stringybark, ironbark, peppermint, tallow-wood, pine, blackbutt, cedar, and dogwood; partly sandy and gravelly soil of granite formation, and partly stony and rocky soil of slate formation. Permanent water in Cataract River, and Wheatley and Morgan Creeks generally contain water. Average annual rainfall, about 34 inches. Dingoes are numerous. Situated about 33 miles from town and railway station of Tenterfield.

					CENTRAL DIVISION.		
1,439 and 1,440	Deniliquin	Morango .. .	......	2	1,110 and 560	23 2 6 and 11 13 4 respectively.	21 Jan.,

Gray soil, timbered with red gum and box; subject to inundation; good pasturage country; permanent water in the Edward River. Rabbits and foxes exist. Average annual rainfall, about 16 inches. Situated about 22 miles north-westerly from Deniliquin, and about 40 miles south-easterly from Moulamein.

680 and 374	Nyngan	New Babinda and West Bogan respectively.	......	2	4,762 (ex roads and portion 8) and 3,464 respectively.	24 16 1 and 14 8 8 respectively.	21 Jan.,

Block 680 consists of level and undulating country, with occasional stony hills; fair to good red sandy soil, with gravelly and stony soil on the ridges; box, pine, gum, wilga, and budtha; one small tank on the block. Hermidale, about 24 miles, and Nyngan, about 45 miles (south-westerly). Block 374 is described as good red soil clay subsoil; box, coolibah, pine, budtha, and a little mallee. No natural water supply, good facilities for conservation. Summervale, 9 miles. The upset annual rent covers the present value of scrubbing done on these blocks, so that no further payment is asked in respect to such expenditure.

FOR IMPROVEMENT LEASE—*continued.*

Block Numbers.	Land District or Place of Sale.	Name of Holding.	Total Area.	No. of Blocks.	Area of Blocks.	Upset Annual Rental per Block.	Date of Sale or Tender.
			CENTRAL DIVISION—*continued.*				
					acres.	£ s. d.	1907.
415 and 416	Wyalong	Yalgogoring	......	2	6,700 and 6,200	15 0 0 and 25 6 8 respectively (inclusive of rent for use of Crown improvements)	21 Jan.

Generally undulating country, parts being level and parts hilly; the dividing range between the Lachlan and Murrumbidgee Rivers crosses this country. About one-third of the area of the two blocks is covered by belts and patches of mallee scrub, and the remaining two-thirds is timbered with pine, box, belar, boree, dogwood, &c.; other scrub upon the land comprises pine, wattle, hop-bush, and quondong. Good red loam on clay subsoil over about three-fourths of the whole area of the blocks; the ridges are stony, and of slate, granite, and quartz formation. No natural water supply, but good catches for tanks are to be found in almost any part. Rainfall, about 18½ inches per annum. The land is infested with rabbits and dingoes. Situated about 6 miles westerly from Yalgogrin, and about 30 miles westerly from Wyalong.

AGRICULTURAL SOCIETIES' SHOWS.

1907.

Society.	Secretary.	Date.
Dapto A. and H. Society (Jubilee Show)	Geo. Lindsay ...	Jan. 9, 10
Albion Park A., H., and I. Society	H. Fryer	,, 16, 17
Central Cumberland A. and H. Association	H. A. Best ...	,, 25, 26
Kiama Agricultural Association	James Somerville	,, 26, 28
Berry Agricultural Association	A. J. Colley ...	,, 30, 31, Feb. 1, 2.
Wollongong A., H., and I. Association	J. A. Beatson ...	Feb. 7, 8, 9
Wingham A. and P. Society	Edward Rye ...	,, 7, 8
Shoalhaven A. & H. Association, Nowra	W. Randall ...	,, 13, 14
Moruya A. and P. Society	John Jeffery ...	,, 13, 14
Tamworth A. Association	J. R. Wood ...	,, 19, 20, 21
Kangaroo Valley A. and H. Association	E. G. Williams ...	,, 21, 22
Alstonville Agricultural Society	W. W. Monaghan	,, 27, 28
Ulladulla A. Association	C. A. Buchan ...	,, 27, 28
Gunning P. A. and I. Society	W. T. Plumb ...	,, 18, Mar. 1
Robertson A. and H. Society	R. G. Ferguson ...	,, 28, ,, 1
Manning River A. and H. Association, Taree ..	S. Whitbread . .	,, 28, ,, 1
Tenterfield Intercolonial P., A., and Mining Society...	F. W. Hoskin ...	Mar. 5, 6, 7
Braidwood	L. Chapman ...	,, 6, 7
Bombala Exhibition Society	W. G. Tweedie ...	,, 12, 13
Berrima A. H. and I. Society	J. Cullen	,, 7, 8, 9
Blayney A. and P. Association	H. R. Woolley ...	,, 12, 13
Campbelltown A. H. and I. Society	A. R. Payten ...	,, 12, 13
Central New England P. and A. Assoct'n, Glen Innes	Geo. A. Priest ...	,, 12, 13, 14
Walcha P. and A. Association	S. Hargrave ...	,, 13, 14
Warialda P. and A. Association	W. B. Geddes ...	,, 13, 14, 15
Goulburn A., P., and H. Society	J. J. Roberts ...	,, 14, 15, 16
Newcastle A., H., and I. Association	Owen Gilbert ...	,, 14, 15, 16
Armidale and New England P., A., and H. Associat'n	A. McArthur ...	,, 19 to 22
Gundagai P. and H. Society	A. Elworthy ...	,, 20, 21, 22
Cumnock P., A., and H. Society	A. M. Martin ...	,, 20
Camden A., H., and I. Association	C. A. Thompson...	,, 20, 21, 22
Inverell P. and A. Society	J. McIlveen ...	,, 20, 21, 22
Mudgee Agricultural Society	J. M. Cox... ...	,, 20, 21, 22
Cobargo A., P., and H. Society	T. Kennelly ...	,, 21, 22
Crookwell A., P., and H. Association...	C. T. Clifton ..	,, 21, 22
Upper Hunter P. and H. Association, Muswellbrook	Pierce Healey ...	,, 21, 22, 23
Royal Agricultural Society of New South Wales ...	H. M. Somer ...	,, 26 to April 3
Yass P. and A. Association	W. Thomson ...	April 9, 10
Orange A. and P. Association	W. Tanner ..	,, 10, 11, 12
Bathurst A., H., and P. Association	W. G. Thompson	,, 17, 18, 19
Cooma P. and A. Association	C. J. Walmsley ...	,, 24, 25
Durham A. and H. Association (Dungog)	C. E. Grant ...	,, 24, 25
Richmond River A., H., and P. Society (Casino) ...	E. J. Robinson ..	,, 24, 25
Macleay A., H., and I. Association, Kempsey ...	Ernest Weeks ...	,, 24, 25, 26
Clarence P. and H. Society, Grafton	T. T. Bawden ...	May 1, 2
Lower Clarence A. Society	G. Davis... ...	May 7, 8
Central Australian P. and A. Association (Bourke)...	G. W. Tull ...	,, 22, 23
New South Wales Sheepbreeders' Association ...	A. H. Prince ...	June 24 to 27
Murrumbidgee P. and A. (Wagga Wagga)	A. F. D. White ..	Aug. 21, 22, 23
Junee P. A. and I. Association	T. C. Humphrys...	Sept. 4, 5
Young P. and A. Association	G. S. Whiteman...	,, 11, 12, 13

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Agricultural Gazette of New South Wales.

The Utilisation of the Murrumbidgee Waters.

R. T. McKAY.

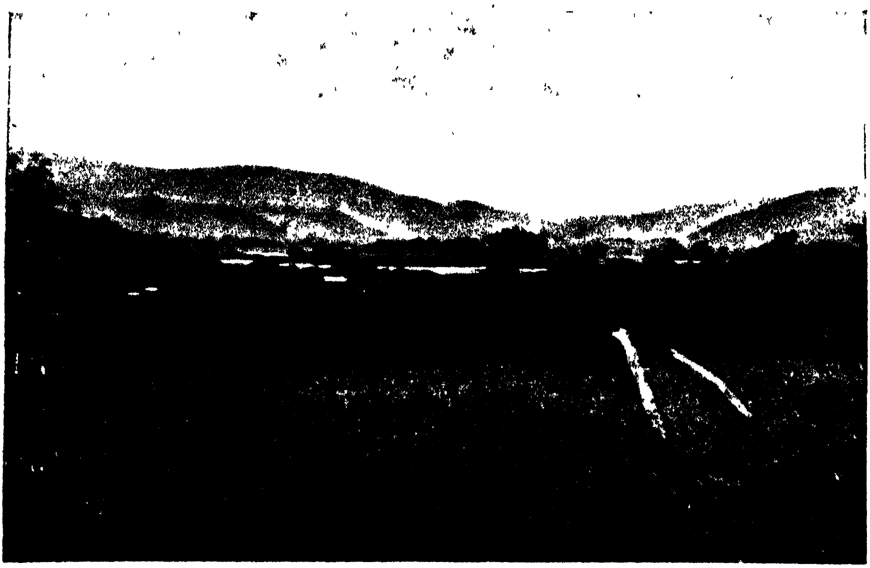
As a result of the great drought, the questions of water conservation and irrigation—so long before the people—have been lifted from the region of cloudland to the range of practical politics. The appointment of the Interstate Royal Commission on the River Murray, representative of the States of New South Wales, Victoria, and South Australia, was a step in the right direction, and the large amount of information collected in the three States by that Commission has been very useful in dealing with the river problems of Australia. Early in 1905 a very important conference on water conservation and irrigation was held in Sydney. It was presided over by the Minister for Public Works, the Hon. C. A. Lee, M.P., and attended by about 160 delegates, representing the districts of New South Wales likely to receive the benefits of irrigation, and the question received a distinct step forward. At that conference certain definite proposals were adopted for conserving the waters of the Murrumbidgee, Murray, and Lachlan, and the Minister then stated that he would not rest until he had initiated a policy of irrigation in New South Wales.

The Land Act of 1884 was responsible for attracting a large number of Victorian farmers to New South Wales, many of whom settled on the arid though fertile lands between the Murrumbidgee and Lachlan Rivers, now proposed to be irrigated.

Selectors could obtain a conditional purchase of 640 acres, and a conditional lease of 1,920 acres, or a total area of 2,560 acres, and families were enabled, subject to residential provisions, to select contiguous blocks and thereby secure holdings of fairly large dimensions. Compared with the small holdings in the more settled districts across the Murray, the Victorian farmer found the rolling plains of the Murrumbidgee Valley specially attractive. Several of them were men of means, with considerable experience in farming in the Goulburn Valley and other districts where the rainfall is much in excess of that on the country where they were to make their homes. It was not long before the lands available for selection on the back portions of the large pastoral holdings fronting the Murrumbidgee were cut up into holdings of 2,560 acres, and settled with families. A few good crops were grown in the wet years, but these were followed by failures, owing to the many dry seasons, culminating in the abnormal drought—unparalleled in the history of Australia—viz., that of 1902 and 1903. The poverty and misery of a number of the settlers was heart-breaking, and many homes which represented the savings of a lifetime had to be abandoned. Right throughout the area deserted homes

are to be met with, and the great drought has left its mark on the district in no uncertain way. One settler, a man of wide experience, has written to the Minister in terms which will give an idea of the effect of the dry seasons during recent years:—

"I have lived in the district north of Darlington Point railway station for the past eighteen years, my area being 1,520 acres, and, I think, equal to anything in the Goulburn Valley district in Victoria. I came from there, and have a good knowledge of both districts. If we only had water enough we could grow practically anything. I have tried grazing and cultivation on my property for fourteen years. For the past five years I cultivated 144 acres, and in those years I sowed thirty-six bags more than I reaped, and had to buy hay and chaff from other parts. I then put in 300 acres on shares with a



The Tumut River is the most important tributary of the Murrumbidgee.
View of the Valley at Blowering.

neighbour, and never took a grain off it. I was then obliged to leave my property and seek employment, where I have remained ever since—four years—during which time my property has been idle, with the exception of three months, it then being leased for sheep. I would not think of going back to live on it under present conditions. It is included within the proposed Murrumbidgee irrigation scheme, which I hope you will be able to carry out. If so, I should be glad to try my luck again and take land, for I know what the country is capable of if one could only get the water. With moisture, grass will grow at any time, and everything that grows will fatten. I know no part where stock do better in a favourable season, and would rather make my home in the district, if the scheme were carried out, than go to any other part."

For some time the attention of the Chief Engineer for Water Supply, and a number of his officers, has been engaged in perfecting a scheme for utilising the waters of the Murrumbidgee, and the proposal has been carefully considered by the Public Works Committee, approved of by that body, and adopted by Parliament. It is a bold scheme, involving a total expenditure of something like one and a half millions of money. The project contemplates the construction of a huge dam at a site called "Booren Yiack," which means a precipitous mountain. It seems a pity that the aboriginal name has been converted into Barren Jack, which is a misnomer, as the country surrounding the dam site presents anything but a barren appearance, as the new name would imply.

Site of proposed Dam on the Murrumbidgee River at Barren Jack.
The Government Geologist says that it has been designed by Nature for the purpose of storing water.

The catchment area of the dam is about 5,000 square miles in extent, and, with the exception of the Tumut River, includes the whole of the most important tributaries of the Murrumbidgee, draining the highest peaks of the Great Dividing Range, which are snow-clad in winter. The winter of last year has been an exceptionally long one, and there were huge deposits of snow on the ranges and valleys of the Murrumbidgee catchment. These deposits might be regarded as subsidiary storages for feeding the proposed reservoir.

The dam site is unquestionably the key of the whole scheme, and it has been selected because of the facilities presented there for storing water in large quantities, its enormous catchment, and comparative proximity to the canal head works. Investigations that have been made show that the

site is the most economical that exists on the main river. The maximum height that it is proposed to build the dam is 200 feet, which will give a water storage of 766,324 acre-feet, or in other words, a volume which would cover that area to a depth of 12 inches. In order to realise the immense volume of water that will be conserved, it may be mentioned that the area submerged will be no less than 20 square miles, and the water will be backed up by the Murrumbidgee River for a distance of 41 miles, the Goodradigbee River 15 miles, and the Yass River 24 miles. The estimated cost of the dam and resumption of submerged land is £800,000.

The present project deals with the distribution of water on the northern Murrumbidgee plains only, but the dam at Barren Jack will be of sufficient capacity to provide for the irrigation of an enormous tract of country on the southern side of the Murrumbidgee.

Boree and Box country on Kooba Station.
Proposed to be irrigated.

It was originally intended to build the dam to a height of 170 feet, and increase it to 200 feet when the canal on the southern side of the river should be put in hand, but it has been thought advisable to carry it to the maximum height at once.

The Principal Engineer for Water Supply has pointed out the facilities which exist at Barren Jack for the development of power, and the water in the first instance may be utilised in this way before being sent down the river channel for the purposes of irrigation. It means the turning of a by-product to a profitable account.

The Murrumbidgee River will be used to convey the water from the dam to the point of off-take, a distance of over 200 miles, and many

benefits will accrue to the towns and settlers between Barren Jack and Narrandera. In the first place, the flood-waters, which at times do so much damage, will be controlled, while on the other hand the natural summer flow of the river will be increased so as to ensure a continuous volume passing down during the months when the river is low.

The main northern canal will take-off from the Murrumbidgee River at the effluence of the Bundidgerry Creek, and will traverse that creek for some distance, flowing through the lower portion of the town of Narrandera, and passing thence through the plain country towards Yanco Station, crossing the railway line at Yanco, and traversing the country to the north and north-west of Whitton, and westerly to Hay.

Land proposed to be irrigated on the Northern Murrumbidgee Plains.
Typical Pine and Yarran country.

The lands proposed to be dealt with include an area of 196,000 acres of first-class, 162,000 acres of second-class, and 1,000,000 acres of third-class country. The first-class lands are situated close to the hills to the north of the Merool Creek, and they are of a red loamy character of over 12 inches in depth, having a rubbly limestone subsoil, with good natural drainage, and embracing some of the most suitable land in Australia for irrigation. The soil on the second and third class lands is somewhat heavier, the surface drainage facilities being good. The country is timbered with Yarran, Mallee, Boree, and Pine on the best of it. The immense open plains towards Hay are very sparsely timbered, and at one time have been covered with salt and cotton bush.

About 1 acre in every $3\frac{1}{2}$ of the first and second class lands will be irrigated, whereas the third-class lands which are occupied in large

pastoral holdings will be provided with a stock and domestic supply, and the irrigation of 30,000 acres, which will mean an absolute insurance against drought.

A large portion of the area will be subdivided into blocks, to be devoted to fruit and cereal culture or mixed farming, and there is unquestionably a big field for our young men in the State in search of land, and those who are arriving from England to make homes. The Agricultural Experts, Mr. W. S. Campbell (Director) and Mr. W. J. Allen (Fruit Expert), have made a thorough examination of the area, and have expressed the opinion that the soil is capable of producing almost anything that can be grown in the State.

There will shortly be very little use for the windmill and troughs on Kooba Station, as the land will be commanded by the irrigation channels.

Mr. F. B. Guthrie, Chemist, Department of Agriculture, has made a soil survey of the irrigable area, and in a report to the Minister concludes his investigation of the analyses as follows:—

Speaking generally, the soils analysed are all extremely fertile, eminently adapted, by reason of their mechanical conditions, for the growth of crops under irrigation. They are all deep soils, of fairly light texture, and with fairly porous and friable subsoils. The situation of the land renders it an ideal area for irrigation, while the natural drainage should be sufficient to render any elaborate system of drainage unnecessary. The soils are well supplied with mineral plant-food, particularly lime and potash. Limestone abounds over the whole area, and the proportions of potash are quite exceptional. They are all extremely active bacterially, and nitrification proceeds

rapidly and vigorously in all of them. They have all a high capillary power, a point of much importance in determining their value for purposes of irrigation. The only defect disclosed by chemical examination is the relatively low humus content and the small proportion of nitrogen. This defect can be best remedied by means of green manuring, which will at the same time correct the deficiency, and by supplying a light mulch in the surface prevent the too rapid evaporation of water. The heavier soils are good wheat lands, and they are all suited to the growth of fodder crops and vegetables.

The fruits which could be profitably grown under irrigation are grapes for raisins, sultanas, and currants; also figs, peaches, apricots, prunes, and citrus fruits; while sorghum, millet, early varieties of maize, and

One thousand tons of hay in shed at North Yanco.

The moat surrounding the shed is about 16 feet wide and 6 feet deep. It protects the hay from mice, and is an insurance against fire.

vegetables of all kinds could be profitably cultivated. The experts also refer to the possibilities presented in the way of growing tobacco, cotton, and lucerne, which should thrive well in the district. With regard to the latter it should prove highly remunerative for fattening stock and for dairying purposes generally. In the Berrigan, Corowa, Deniliquin, and other districts, many farmers do remarkably well by raising and fattening lambs, and when it is remembered that they have no assured water supply, but have to rely on the caprice of the rainfall, it is evident that this industry should prove a great adjunct to the ordinary business of farming on these Murrumbidgee Plains, with a certain water supply which can be

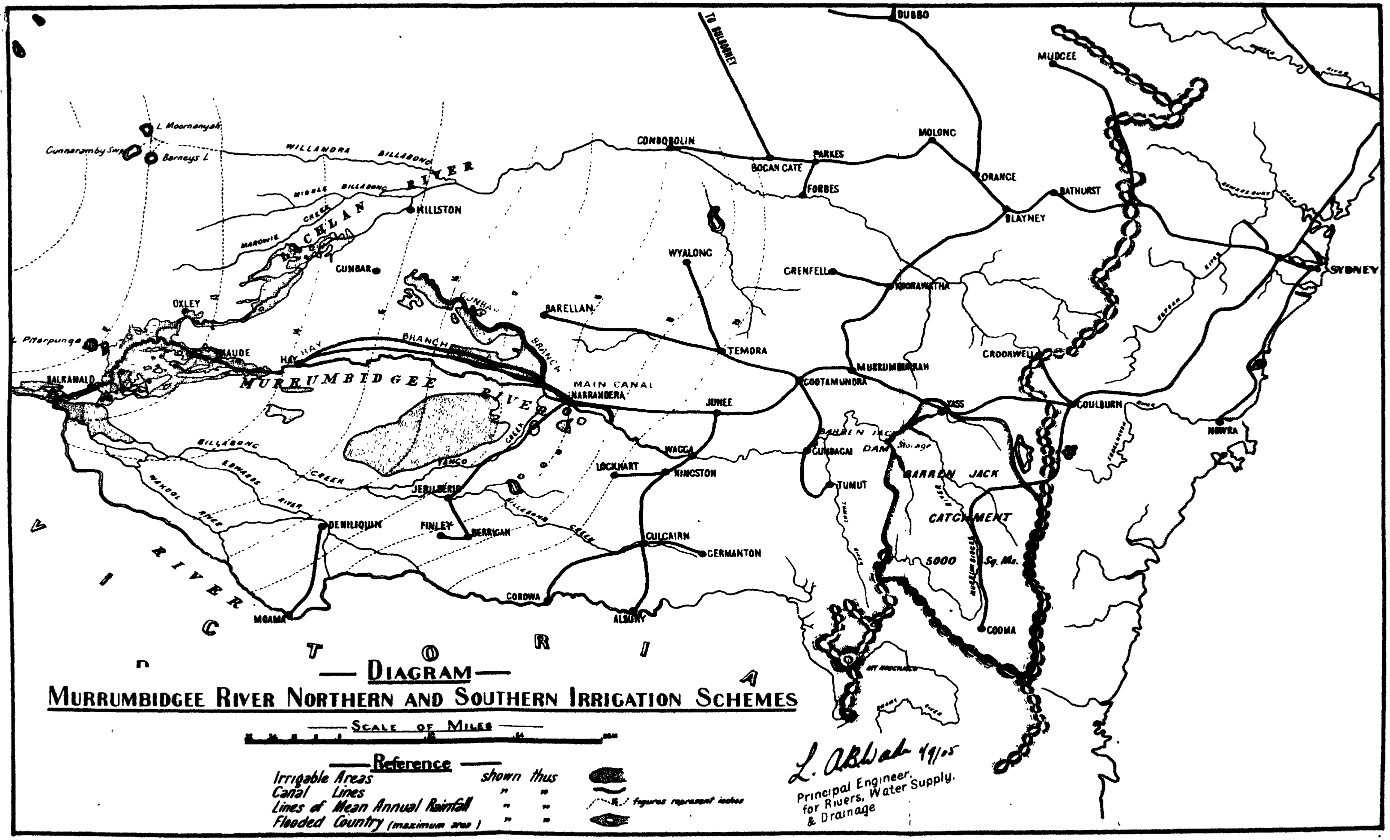
turned on the land when it is wanted and where it is wanted. The cultivation of figs is a business from which the very best results are forecasted, and, given proper methods of cultivation, a net profit of £28 per acre per annum is spoken of. Root crops, such as artichokes, turnips, potatoes, and onions, should succeed very well. Seeing that the onion crop is a profitable one, even where water has to be raised for irrigation to various heights up to 60 feet—as in the Wellington district—it looks well worth going in for in connection with the Barren Jack scheme.

A word or two about the financial aspect of the scheme. Notwithstanding the fact that it is going to run into about one and a half millions of money, there is scarcely any doubt that it will prove a financial success.

Lucerne under Irrigation, North Yanco Station.

Sir Samuel McCaughey has a large area under lucerne at North Yanco and obtains excellent results.

The most expensive portions of the scheme are the storage works, head works, and main channel, and it will be seen that a very large proportion of the expenditure must be undertaken before any lands are placed under irrigation, consequently the scheme cannot be expected to pay during the early stages. The Chief Engineer for Water Supply has made what he regards as a conservative estimate, and has based his conclusions on the settlement of the area within fifteen years. Up to that period there will be an annual loss, but thence onward the scheme will begin to show a profit, and it is estimated that from the fifteenth to the twenty-second year there will be a surplus of £46,000, which will increase annually by £8,000. Owing to the great demand for land that exists at the present


— DIAGRAM —
MURRUMBIDGEE RIVER NORTHERN AND SOUTHERN IRRIGATION SCHEMES
— SCALE OF MILES —
— Reference —
Irrigable Areas shown thus
Canal Lines " "
Lines of Mean Annual Rainfall " " figures represent inches
Flooded Country (maximum area) " "
L. A. B. Wade 4/9/05
Principal Engineer, for Rivers, Water Supply, & Drainage
V I C T O R I A
MURRUMBIDGEE RIVER
LACHLAN RIVER
RIVER
MAIN CANAL
BRANCH
BARREN JACK DAM Storage
BARREN JACK CATCHMENT 5000 Sq. Ms.
WILLANDRA BILLABONG
MIDDLE BILLABONG
MAROWIE CREEK
BILLABONG CREEK
EDWARDS RIVER
WAKOOL RIVER
YANCO CREEK
L. Moornanyah
Cunnaramby Swp.
Barneys L.
L. Piterpunga
TO BULBODNEY
DUBBO
MUDGEE
MOLONG
ORANGE
BATHURST
BLAYNEY
CONDOBOLIN
BOGAN GATE
PARKES
FORBES
HILLSTON
GUNBAR
OXLEY
MAUDE
HAY
BALRANALD
WYALONG
GRENFELL
KOORAWATHA
BARELLAN
TEMORA
COOTAMUNDRA
MURRUMBURRAH
CROOKWELL
GOULBURN
SYDNEY
NOWRA
YASS
JUNEE
NARRANDERA
WAGGA
GUNDAGAI
TUMUT
LOCKHART
KINGSTON
JERILDERIE
FINLEY
BERRIGAN
DENILIQUIN
MOAMA
COROWA
ALBURY
CULCAIRN
GERMANTON
COOMA

time, it is probable that the area will be settled much more quickly than is anticipated, and the scheme may prove a highly remunerative one in the tenth year of settlement.

The first claim on the available supply is the allotment of sufficient quantities of water for stock and domestic purposes, and for this service a rate will be charged. The remainder of the available water will then be divided for irrigation purposes, one part to be apportioned as a water right, for which the owners of land shall be liable to an annual charge whether the water is used or not, and the other portion to be supplied to owners or occupiers of land under contract. The rate proposed for the

Typical Pine country on the Northern Murrumbidgee irrigable area.
Pronounced by the experts of the Agricultural Department to be ideal country for irrigation

sale of water is 5s. per acre-foot, or about one-third of the amount paid by the Mildura settlers in Victoria.

In addition to these rates, an owner's rate will be imposed which will be on the lines of the owner's rate in operation on the successful irrigation schemes of India. The Public Works Committee, in dealing with this phase of the question, pointed out "that, as the construction of the proposed works will add considerably to its value, unless it be resumed or adequately rated, that value will accrue to the owners instead of to the State. Resumption would, of course, mean the expenditure of a very large sum of money, even if, as suggested by the Department of Public Works, provision be made in the Bill for the carrying out of the Barren

Jack scheme that the price paid for resumed land shall not exceed the value of the land before the construction of the works, and might seriously hamper the scheme financially, whilst rating the land might not only bring in revenue equal to the added value, but influence the owners to a subdivision and better use of their holdings."

The State will be recouped for every penny of the outlay, and the computation has been made on a basis of $3\frac{1}{2}$ per cent. interest, which, with sinking fund, will be spread over 100 years.

Johnson Grass under irrigation at North Yanco.

State Control.

Mr. Lee, in introducing the Bill authorising the construction of the works, made it very clear that the scheme would be a national one, and entirely under the control of the State. The Bill dealing with the administration of the scheme is of a comprehensive character, and will be submitted to Parliament during the coming Session.

In America, the Irrigation Law of 1902, providing for the construction of the irrigation works by the National Government, has led to the enactment of a number of laws in the arid region. The National Government is given the right of way over the State lands, and the State lands included in the areas to be reclaimed by the Government. Irrigation works are to be disposed of only in accordance with the classification of farm units, made by the Secretary of the Interior.

Mr. R. P. Teele, Expert in Irrigation Institutions, United States Department of Agriculture, states that the year 1903 was responsible for a greater extension of effective public control than any previous year. The same may be said of 1905. Previous to 1903, anything like complete public control was confined to Wyoming and Nebraska. In 1903 and 1905 such control was extended to Utah, Idaho, Nevada, North Dakota, South Dakota, and Oklahoma, and beginnings were made in New Mexico and Oregon, while Washington and Montana have appointed Commissions to draft codes of water laws. This great activity of enacting laws shows a very general recognition of the necessity of public control. Differences of opinion relate largely to methods. In India and Egypt all large water

Valley of the Murrumbidgee at Good Hope, near Yass.
Showing Mr. Argyle McCallum's maize field The valley at this spot will be submerged to a depth of 70 feet.

conservation and irrigation works are national in character, being constructed and administered by the Government, so that the Barren Jack scheme will be on the lines of recent legislation in other parts of the Globe.

An important feature of the scheme is the proposed resumption of 177,000 acres of first-class lands, and its resale at an enhanced value, resulting from the construction of the works. It is to be hoped by this means to recoup the State on the outlay of half the cost of storage works.

There can be no question as to the desirableness of establishing an experimental farm in connection with the scheme, where farmers and

others who intend to become irrigationists shall be instructed in the direction of properly using the water. If people are to settle on an irrigation area, they should not only be given every possible facility for growing the best crops, but they should be educated in the application of water, the general question of tilth, the pruning of trees, and kindred subjects. It would be a lamentable thing if the scheme should not prove the success anticipated, owing to the ignorance and want of experience on the part of the settlers. The Minister for Works has expressed his intention of establishing an up-to-date demonstration farm within or contiguous to the proposed irrigable area, and it will also include a nursery where settlers will be able to obtain vines, fruit-trees, &c., true to name, at cost

Bywash, Billabong Creek, near Jerilderie.

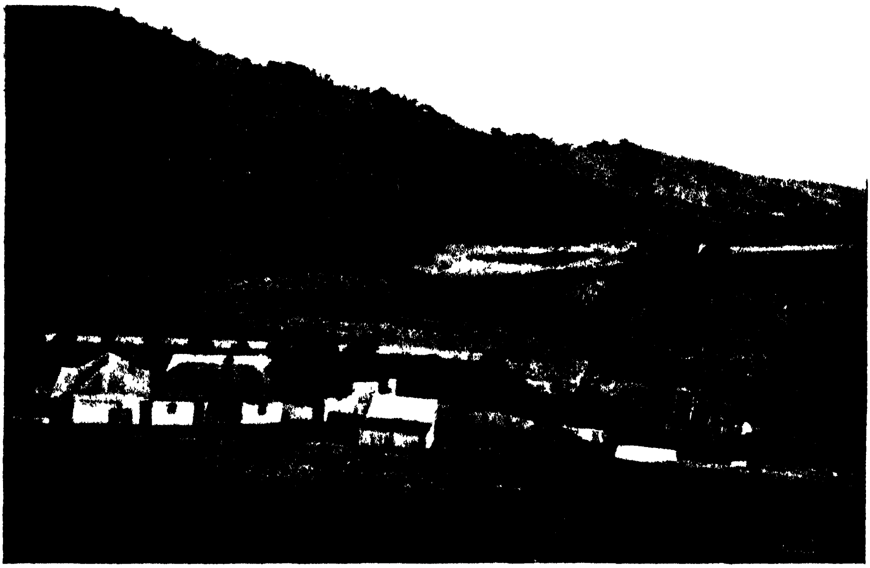
There is fine irrigable land adjacent to the Billabong Creek, which discharged a large quantity of water during the latter part of last year.

price. This is a very important matter, especially when one considers the great disappointment and loss of time occasioned at Mildura, where settlers, after waiting several years for the vines and trees to bear, found that it was necessary to root them up and plant fresh stock, as the nurserymen had supplied them with indifferent stock not true to name.

The grading of lands proposed to be irrigated is a detail often neglected in early irrigation efforts, and settlers will be instructed in the method of thoroughly preparing the land prior to cropping. In the case of a perennial crop, such as lucerne, there is an urgent need for the ground to be prepared, and the hummocks should be removed and the depressions filled up, as uneven surfaces will have a marked influence on the

yields. Large areas of plain country adjacent to our rivers appear level to the naked eye, but the irrigation of such land quickly finds out the inequalities of the surface.

During the early period of settlement, the volume of water will be much in excess of the demand; but as the areas now under pastoral occupation merge from the transition stage of development and become closely settled by agriculturists, the supply will be drawn upon to such an extent that the settlers will require to study its economical use, and it is on such points that the experimental farm will be of great value from an educational point of view.



Farm-house and Maize Field at Good Hope, near Yass.
The top water level of the Barren Jack Reservoir will be about 50 feet above the house

It is pointed out that the Barren Jack scheme is only the first instalment of a scheme of water conservation, embracing the Murray, Lachlan, Tumut, Darling, Namoi, and Macquarie rivers of New South Wales. Both the Premier and the Minister for Public Works have clearly stated that the Government intend to utilise the waters of these rivers in the near future in a great national scheme for the development and closer settlement of the several divisions of the State. The Murrumbidgee has been selected in the first instance for the initiation of the work, owing to the enormous advantages it possesses in storing water in large quantities.

In addressing the great National Irrigation Congress held at Boise, Idaho, U.S.A., in September last, the Vice-President, Mr. Fairbanks, stated that "the general subject which is under consideration is one of those practical every-day questions which requires the application of good

business sense. The real benefactor, we understand, is the one who makes two blades of grass grow where one grew before. Those who have engaged in the promotion of irrigation fall most distinctly within this definition, and are benefactors of their day and kind. They have the satisfaction of knowing that they in a measure have promoted the interest and welfare of the home-maker. They have overcome many of the seemingly impossible obstacles of nature, in the great arid and semi-arid regions, and have erected their habitations and made prosperous and happy neighbourhoods. Some of our wisest statesmen, of not a very remote past, had but little conception of the possibilities which have been opened up to our country and our civilisation; we may well believe that even with our large experience and greater light, we have as inadequate a conception of the vast possibilities of this western section of the country, as many of our predecessors had of the large development which has already been accomplished. The growth of irrigation thus far is largely due to individual and corporate enterprise. It has been carried on by our people for many years in a more or less satisfactory way, but it has not been until recently the subject of national consideration. Fruits, vegetables, and grains of almost every variety are produced in profusion upon lands which but a few years ago seemed to the casual observer absolutely valueless, and beyond the hope of cultivation." These remarks are equally applicable to our State, owing to the similarity of conditions in regard to soil and climate. We cannot hope to place the millions of acres under irrigation as it is possible in America; yet we can, by adopting proper methods, accomplish such results that will in a few years make the pessimist of to-day marvel at what has been achieved.

The central and western divisions of the State can never be declared immune from drought, unless the flood-waters are impounded and the country irrigated. Every drop of water that falls should be accounted for. The losses in flocks and herds during the drought of 1902-3 were simply appalling, and it is estimated that it cost Australia £130,000,000. Years like 1906 are not likely to be the general order of things, and, looking at the past history of the State, droughts are bound to occur in the near future. Are we on the dawn of a new era? Remembering all the talk there has been on this question for the past twenty years, it seems hard to realise that something tangible is within measurable distance.

The Date Palm (*Phœnix dactylifera*).

A Wandering Plant.

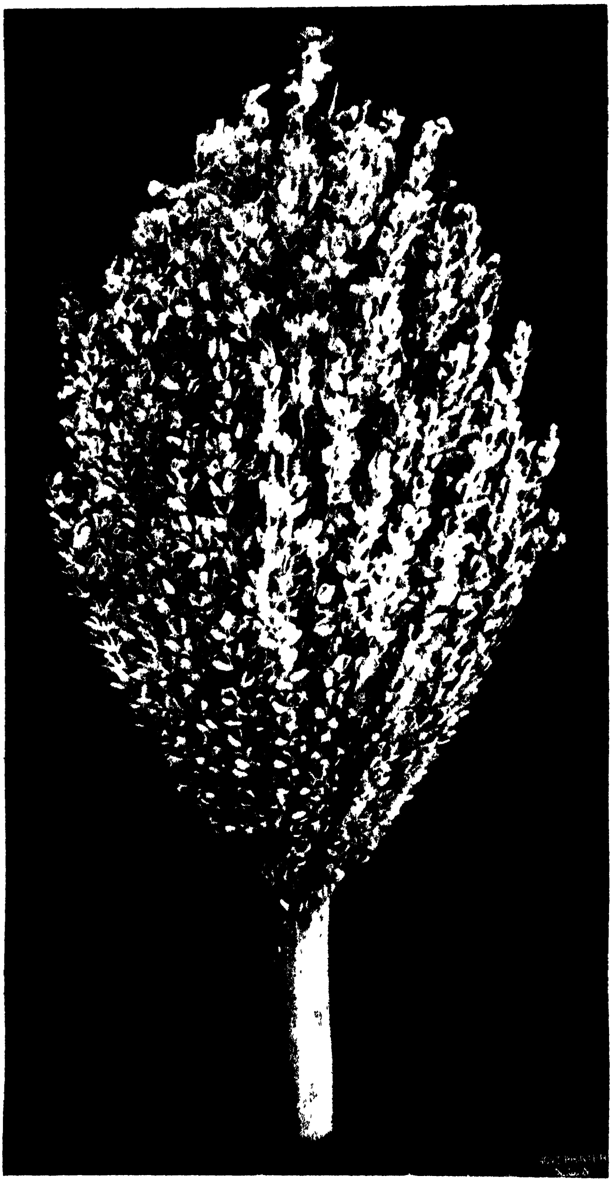
WALTER W. FROGGATT, F.L.S.,
Government Entomologist.

OUT beyond Bourke, on the fringe of settlement, lies the little oasis around Pera Bore, one of the many spots where the great underground water supply has been tapped by the perseverance and enterprise of man; and rain, that probably fell hundreds of miles away, comes rushing upward from thousands of feet below, and pours its foaming artesian water, destined to make the surrounding country green and fruitful, out into the bright sunlight. A few years ago there was quite a large settlement of small farmers and orchardists who profited by this water supply, and good crops and fruits were grown for the local markets, but at the present time only two or three remain, the abandoned homesteads and neglected gardens being the only traces of the former occupants.

Surrounded by a flourishing garden and orchard, where some of the finest oranges in Australia are grown, is the manager's homestead. Down one side, the most prominent feature of the landscape, is the grove of date palms, about thirty in number, and, in spite of many vicissitudes and somewhat irregular attention, many of them have developed into well-grown trees, that raise their large fronds upward into the burning summer sun of the western Darling. The camel drivers, plodding down the track from out back, notice their familiar shape, so different from the surrounding native scrub, as they drive their patient beasts along through the dust; and who knows what thoughts and homesick feelings come over them as they recognise their fellow exiles. It is strange that all through history the domestic camel and the cultivated date palm have followed the Arab across the world, from the valleys of southern Asia, through the deserts of Africa, even into Spain with the Moors came the camel, "trampling the vines of Spain," while their dark-skinned masters planted the date palms all about their picturesque towns, some of which still remain. Here we find in Central Australia history repeating itself, the Arab, the camel, and the date palm forming a picturesque group in natural surroundings of sand, scrub, and glaring sunlight.

About fourteen years ago our Department obtained these date palms through the courtesy of the Algerian Department of Agriculture; they were forwarded in large earthenware pots, and afterwards sent to Pera, where Mr. W. S. Campbell, the Director of Agriculture, planted them. Originally thirty in number, there are now only twenty-seven, seventeen of which are females. Though they commenced to grow fruit some years ago, they were pollinated in a very irregular manner, and it was not until

this season that the question of pollinating the female flowers was raised, after the methods of the Arab cultivators. On the 28th of August, I



Male Flower of Date Palm *(Phœnix dactylifera)*

visited Pera Bore, and made some notes on the date palms, which have led to the compilation of these notes. The only other date palms cultivated in Australia are, as far as I know, a few down the Darling at

station homesteads, and a very fine grove at Hergott Springs, in the north of South Australia.

In America, the United States Department of Agriculture have sent out a number of officers to collect the best kinds of date palms to introduce

Female Flower of Date Palm *(Phœnix dactylifera)*.

into the southern desert country of Colorado; but it is very doubtful whether the undertaking will be a commercial success, as the question of labour, as well as climatic conditions, will always be a serious difficulty.

The date palm is one of the oldest cultivated trees in the world, and

records are said to exist proving that it was domesticated on the shores of the Persian Gulf 5,000 years ago; and an American traveller recently estimated "that there must be not less than fifteen to twenty million date palms in this great territory." The natives of Babylonia, on the plains bordering the Euphrates and the Tigris Rivers, are known to have grown them, and the Arabs after them. Its scientific name, *Phœnix*, denotes its native place, Phœnicia, from where it was first obtained by the Greeks. It was the tree of Phœnicia, and was figured upon their coins, and later on upon the Carthaginian coins struck in Sicily.

Away back in the forgotten centuries this wonderful tree has produced the main food supply of an immense area of Asia, and later in Africa; for, though the wild date palm stretches across Arabia and northern Africa, and even into the Canary Islands, it was not a domesticated tree until the advent of the Arabs into Africa, who taught the natives the value of the date, and later on introduced the camel. This tree, typical of the desert where nothing else will grow, has through its presence developed a large population in what would be otherwise a most inhospitable region. Under the shelter of their spreading foliage nestle the Arab huts, and beneath the shade of their over-arching fronds many other crops and fruit-trees are cultivated that would not grow under the direct rays of the desert sunlight—a garden and orchard under a forest.

The vast stores of dates dried for export are the chief article of commerce carried on along the great caravan routes forming a network of roads over southern Asia, for, as before noticed, the camel and the date travel together, both domesticated by the same people through their needs, who evolved a useful beast of burden from the wild camel, and a rich food-producing fruit from a nut-like palm seed.

The date palm even wandered round the northern shores of the Mediterranean into the empire of the Greeks. There it was freely planted as an ornamental tree, for it was an unsuitable climate to produce fruit, and was simply cultivated for its graceful form, and is frequently mentioned by the ancient writers.

The date palm is the symbol of the East. No picture of desert scenery is complete without a palm in the background; and in all the traditions, folk-lore, and legends of the Arabs it plays an important part. "The King of the Oasis," says the Arab, "bathes his feet in water, and his head in Heaven's fire." Mahomet taught them: "Honour the date palm, for it is your aunt on your father's side; it is made of the same stuff as Adam, and is the only tree artificially fructified." No wonder that the Arabs instinctively venerate this wonderful tree, with its great loads of luscious fruit, and its grey old age outlasting their own lives—for the average life of the date palm is about 100 years, during which time it will attain a height of 50 feet, crowned with its crest of feathery fronds.

The date belongs to the great family of palms, all of which are semi-tropical in their range, and most of which produce hard nut-like seeds,

though the graceful cocoanut palm is a marked exception, and also the sago palm, with its stout stem enclosing a rich store of starchy food among its fibres. All palms grow from one terminal bud, and each great frond or leaf might be likened to the branch of the more modern tree. If this terminal bud is injured the palm dies; so, in the very early stages of its existence, a baby palm is a delicate plant with many enemies.

This palm throws out from twelve to twenty fronds every year, which in turn are replaced with a fresh crown of fronds; in the course of years the lower leaves wither and droop, or fall downwards, the basal stalk becoming incorporated in the cylindrical stem, which remains of uniform dimensions year after year. Like many other palms, the sides of the basal portion of the leaf-fronds are furnished with rows of sharp needle-like spines, which are, in its wild state, probably of great value as a protection against the plant-eating animals of the desert. The date palm, however, differs from all other members of its family, in the fact that the trees are of distinct sexes—male or female trees—a male tree bearing male pollen-laden flowers, and the female only fruit flowers, very simple in form. In general appearance they are exactly the same, until the great pod-like flower-spathes shoot up at the apex among the leaf-stalks. Those upon the male tree are more flattened than the sheaths on the female trees. When this splits down the centre, it exposes a large mass or bunch of dull pale-yellow petiolate flowers attached down each side of the slender finger-like filaments, the whole forming a drooping cluster of flowers springing from one common base. Each of these flowers contains an immense quantity of fine yellow dust, like pollen grains, which, as soon as the flower expands, falls in a shower and blows along in the wind at the least movement. The flower-sheath of the female tree opens down the centre in the same manner, and reveals a mass of similar-constructed filaments, but they are fringed down the sides with rounded button-like structures, each of which is a baby date. If no pollen falls upon these young fruits they simply grow for a short time and then drop off, leaving a bunch of broom-like sticks in the place where the bunch of dates should have grown. If, however, as in the natural course of events, the pollen of the male flowers reaches the tiny dates, each grows out into a perfect oval oblong date. In their wild state, or if grown from seed, the male and female trees would come up in equal numbers, and the fine dust-like pollen is so thick in the air as it is freely blown about that most of the fruit would be naturally fertilised; but at a very early date the Assyrians found that it was a very wasteful business to cultivate and irrigate 50 per cent. of non-fruit-bearing trees, considering the immense number of flowers and pollen that each male tree produced, so they studied the artificial pollination of the female flowers; and the Arabs continued this work, until, by the careful division of the strings of the male flowers, which they attached to the spathe just above the expanding bunch, they found that each male produced enough flowers to pollinate the fruit bunches of 100 female date palms.

Each well-grown palm will under cultivation produce from fifteen to twenty fruit bunches, each capable of turning out from 15 to 30 lb. weight of good dates; but, as a general rule, the tree is only allowed to mature eight large bunches, the small and inferior ones being cut out. The date palm, in the first decade of its life, has a curious habit of producing suckers or shoots from the side of the trunk, which partake of the nature of the parent, being male or female, according to the tree from which they grow. These suckers are carefully removed and planted, for they produce fresh palms much more rapidly than they could be raised from seeds, with the added advantage that the cultivator knows the sex of the tree. Though the date palm was once a hardy desert tree, it has been domesticated and cultivated so long that it must have a regular supply of water at its roots to grow good fruit; and to insure this, a regular network of irrigation channels intersect the oases in Arabia and the Sahara. In many parts of the latter the village priest, whose duty it is to sit all day in his little mud-brick tower and regulate the supply of water due to each cultivator, watches his hour-glass, and strikes his gong when the sluice-gates are to be closed and the water is to be diverted to fresh land; and so well is the system carried out that few disputes ever occur.

Scattered all over the uninhabited desert, however, it must be remembered that many clumps of wild date palms will be found that differ very much from the cultivated varieties. Travellers state that where such a tree springs up it throws out innumerable suckers, which soon form a thicket round its base, and they in turn sending out more suckers soon form an impenetrable thicket, from the centre of which towers up the original parent tree, not with a free green crest upon the apex of its slender trunk, but clothed with ragged, dead leaves half-way down to its feet.

The question of growing the date palm in numbers at the many artesian bores extending over a very large area of central Australia may some day be seriously undertaken, for we know not only will they flourish and grow into fine shade trees, but that they will produce good marketable dates in our dry heat. It has been demonstrated by the American botanical explorers sent out by the United States Department of Agriculture that it is easy to transport the suckers from Arabia and Africa, if carefully packed in bundles, and when they are established suckers can be obtained from them, so that a small grove could soon be extended.

Grading and Marketing Farm Produce.

E. D. BUTLER,
Inspector, Department of Agriculture and Commerce Act.

It has occurred to the writer that there is ample room for improvement in the manner in which farm produce generally is prepared and marketed in this State, and it is from observations made and a little inquiry into the subject that he has been prompted to make a few suggestions. It is not the intention to go into detail on the different products of the farm, but in a general way to give briefly a few hints, in the hope of inducing the farmers to adopt, in their own interests, more careful and up-to-date methods.

It has been said that the success of the farmer depends upon an aggregate of small profits, and it may be stated, with equal truth, that failure is often, if not always, due to an aggregate of small losses. It cannot be denied that in marketing farm produce the art of taking infinite pains is essential to profit, and the lack of it ensures certain loss. Anyone may be convinced of this if he takes a walk through the market streets or along the wharfs where fruit and produce is extensively handled. On every side he will see produce of good quality selling at reduced prices, owing to the form or manner in which it is put up, and, in many cases, set aside as not worth handling, owing to the disregard to grading, and in some instances to its damaged condition, and to inferior bagging, which, with a little care, could have been avoided. In such cases the only profit accrues to the carrying company whose charges for freight depend not upon quality, but quantity. The amount paid to the railways and steam companies for carrying farm produce which, on arrival, proves to be unsaleable, must be considerable, not to mention goods sold for below market rates, through being put up carelessly and in unsuitable packages.

Honesty should constitute a general principle to be observed, for there is no business to which the adage "Honesty is the best policy" so aptly applies, and it seems as though there was no legitimate business in which it is so often disregarded. It may be safely said that where petty deception is attempted, it proves a "boomerang." Probably the dishonesty most commonly practised is improperly facing cases of fruit and topping bags of potatoes. The trick has been tried so often that even the most inexperienced buyer will look out for it; the top, sides, and bottom are invariably tested, so immediate discovery is almost inevitable. Even when the shipper is successful in fooling the buyer, the latter, discovering that he has been deceived, relates the story to his fellows—the story usually growing as it travels—until it not infrequently happens that the shipper's goods are practically boycotted, even the most fancy stock being neglected,

because it bears the shipper's brand. On the other hand, painstaking care and patience will generally result in building up an enviable reputation, securing for his shipments top prices, because of their known unvarying good quality. When a producer desires to build up such a reputation, it will pay him to adopt a special brand or mark, having first ascertained from his commission agent that his brand will not interfere with any other on the market. Stencilling his bags or cases with his full name is to be recommended. He should then make a rule, from which there must never be any deviation, to use it only on his choicest products. Anything not being up to the standard should be sold under a different brand. Such discrimination against the poor qualities of one's own product requires strength of character and firmness of purpose; but such a policy steadfastly pursued will result in a reputation for the goods bearing the brand which will never fail to obtain the very top of the market.

After attending to the quality, another important consideration is the packing. The farmer, after a study of the route his produce has to take, might convince himself of this. Nearly all the produce grown in this State is marketed in bags, and ere it reaches the market is probably subjected to several miles haulage in a dray from farm to railway or steamer over a more or less rough road; then, perhaps, hurried and careless handling, possibly some days, in transit, perhaps in an ill-ventilated truck or hold of a steamer, unloaded on wharf, reloaded on waggon for transhipment or conveyance to store. It is thus obvious that there is a necessity for extreme care. To pack properly requires experience, but some practical suggestions may be given. If possible, there should be a packing shed, and the more air and light there is in it the better. Decay is the great enemy to be guarded against, and heat and moisture are its greatest promoters. Wherever possible, permit your produce or fruit to cool from the heat of the day before packing; make sure they are perfectly dry and packed tightly, taking care, if potatoes, to remove all soil that might be attached to the tubers; also bruise nothing, for bruising liberates moisture, which, in turn, produces decay. Either too loose or too tight packing results in bruising, for if after being shaken down in transit there is room for the contents to shake about, they will certainly be bruised. In packing fruit, particularly, let the degree of ripeness in each package be uniform. When hard, unripe fruit is put in the same package with tender ripe fruit, the latter will be bruised and all decayed. In stacking or storing, see that space for free circulation of air is left, as this will do much to prevent heating and decay.

Another great cause for bruising and decay is the slings used in discharging potatoes from vessels; the rope slings should be replaced by a strong netting or wide canvas sling. This would reduce the liability of bruising, and more careful handling could and should be exercised.

Growing the crop is only half the farmer's business. He must not only produce what the people want, but put his goods up in as attractive a

condition as possible, so that it will commend itself to buyers. Instances are not wanting where the neglect of these important considerations have not only resulted in immediate losses, but important trade has been transferred to other markets and lost for years, perhaps permanently, and there is no doubt that the change was not owing to any superiority in the quality of the goods, but simply because the successful competitors paid more attention to details, and took more pains to satisfy the convenience and tastes of the buyers. In certain respects these tastes vary in the different States of the Commonwealth and New Zealand; hence the farmer or exporter must study the requirements of the different markets to which he is a contributor. The trade in the different varieties of produce is so organised that between the producer and the consumer it generally passes through many hands—possibly, the local buyer, the commission agent, and the retail seller. This has a tendency to leave the producer in ignorance of the taste of the consumer, which is invariably the ultimate standard by which the value of his produce is fixed. In some instances, far-seeing agents take pains to acquaint their clients with the demands of the markets to which they ship; others do not do so, leaving them in total ignorance of such requirements. However, the farmer should be well aware of the main points to remember when preparing his produce for market; but he might be here reminded that these points are neatness, cleanness, and uniformity. The fact that the goods are to be eaten should never be lost sight of, nor should it be forgotten that if they are to bring the highest price, it is these points that will attract the buyer. It may be accepted as practically an unvarying truth that the finest produce will not bring the highest price if packed in unattractive packages. It is false economy to use second-hand bags or cases. New ones should be used always; they will be found more profitable, and always repay the extra cost. Nor is it safe ever to aim at anything but the highest price for good produce, for should a shipment deficient in any way as to style, neatness, form, &c., happen to reach the market, either when the demand is light or the supply excessive, it will remain unnoticed until the best lines have been picked up, and then, the demand having been supplied, must await the next day's buyers, suffering severely by the delay, and, perhaps, eventually sold for less than freight, and in many cases carted to the tip—a total loss.

These remarks are in no way an exaggeration, and are in evidence every day in this city, and now that the Commonwealth Commerce Act is in operation, farmers should make themselves acquainted with its regulations. One of its primary objects is to raise the standard of Australian products in the other markets of the world, so it behoves farmers to pay more attention to the grading and general "get-up" of their products than has heretofore been the case.

Mixed Farming.

R. H. GENNYS.

THAT mixed farming is the best and most profitable farming has been recognised by advanced agriculturists for a considerable time; but the average farmer is somewhat slow to take advantage of it. That it is not wise "to put all your eggs into one basket" is obvious to all, and in running a farm for profit this wise saying is very applicable.

One product is up while another is down, and the ordinary farmer, with the limited knowledge he possesses of the ramifications of the markets, cannot forecast with any certainty what crop will be most payable to him during the year. Of course, every man should decide what is to be his main source of income, and for which his soil and climate is best adapted; but to keep to one project alone to the exclusion of all others generally means failure in the long run, and the slow exhaustion, or, it may be, the quick destruction of the soil for his one pet project, which may be dairying, wheat-growing, fruit-growing, or anything else.

Take dairying as the main; it is obvious that something more is required than finding grass paddocks and milking the cows twice a day. Fodder must be grown and conserved, either in the form of ensilage or hay—the former very much for choice. Some farm horses must be kept to do this and cart the cream to the factory; it is better to grow corn and hay for them instead of buying it, and while on the job, if there is any spare time, grow something more than is required for use. Maize may be up when butter is down, and the surplus for sale helps the revenue from the farm.

Pigs should, of course, be kept on a dairy-farm, and their usefulness to dispose of waste products, skim-milk, maize cobs, &c., is too well known to need further comment. A few fowls too are profitable in this connection, and generally in all farming, and in themselves form a most important branch of live stock, which is not here touched upon.

In fruit-growing, too, fowls and pigs play an important part when properly used in connection with using up surplus fruit and destroying pests. Sheep also may be used to some extent in this connection; but care must be taken not to turn them into a very young orchard, with young shoots easily accessible. In an old orchard, however, they may be used for eating up wind-falls, and get rid of fruits containing codling moth, &c.

In wheat-growing, something more is required than ploughing the ground and sowing the seed year after year, and this is an industry that permits of several very useful adjuncts being introduced, both in other

crops and in live stock, sheep in particular being most useful. Sheep for mutton purposes and cereal crops can be worked together most profitably; they help one another in almost every respect.

Land whereon the same crop is grown continuously must in time lose some essential plant-food. In wheat especially, nitrogen is the more important, and land deficient in vegetable matter soon gives out. Deterioration of crops follows, till the land becomes unprofitable. Better far to sow a crop of rape, or other crop such as clover or tares, between crops; this can be eaten down by the sheep, lambs and old sheep fattened, and a most readily available manure put on the land without expense. Sheep may, in the earlier planted crops—such as Manitoba wheats, which have grown too rank—be put on to feed them off, to their mutual improvement. Sheep put on to paddocks after crops are taken off destroy the weeds, manure the land, and tread down stubble, enabling the latter to be more efficiently ploughed under; far better this than burning stubble and weeds, which, unfortunately, some growers persist in. Nitrogen, which it is so important to conserve, in lost in combustion; the inorganic plant-foods are, however, returned in the ashes. Much fine wheat land has become depleted of the necessary nitrogen by this process of burning being continued year after year.

Should the farm be too small, or, from some cause, not convenient to keep sheep on, the rotation of crops must be practised or returns will soon diminish, through weeds and deterioration of soil; the latter, of course, may be counteracted by using artificial manures, which, indeed, are a boon to poor lands, and are helpful often to soils that have the appearance of being rich. Experimenting, therefore, on any land may be of value, as there may be one essential plant-food in insufficient quantity for the proper development of the crop; or, it may be, a stimulant such as lime is required to correct detrimental acids, and make dormant plant-food available. These manures, however, are expensive, especially nitrogenous ones, and with a proper rotation of crops much may be saved. Cowpeas, field-peas, clovers, tares, and all legumes have the power, through the agency of bacteria, of obtaining nitrogen from the air, thereby adding a fresh supply to the soil, and their deep searching roots also bring up from the subsoil much valuable food, which, if they are ploughed in, becomes available for shallow-rooted crops.

In no case should legumes, such as peas and beans, be pulled up, but their roots, which are very valuable, should be left in. Apart from this, a change of crop, say, from oats or wheat to maize, is beneficial. The latter is a deep searching plant, and pulverizes the soil, aerating and improving the subsoil for a succeeding crop, and the process of after cultivation destroys weeds and improves the general condition of the soil.

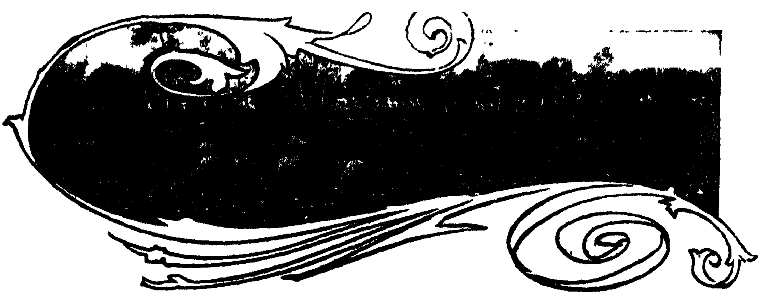
If one crop alone is persisted in, one ingredient is exhausted, while another, of which there may be large quantities, which can be well spared, is almost wasted; therefore, potatoes are a help between cereals, as they

require more potash than the latter, and less nitrogen. The cultivation required for them is also a splendid preparation for all cereals.

Clovers sown with shallow-rooted grasses are helpful to the latter in bringing plant-food up from the subsoil and obtaining more nitrogen than they themselves require, from the air.

To sum up, mixed farming conduces to a more even distribution of work throughout the year. Good assistants can be profitably employed all the time at a less rate a day than if only employed for a short time, say, during harvesting; this is manifestly better, both for the employer and the employee. Farm horses are none the better for too long spells, and they very often must be fed just the same when not at work as when working. Also the returns are coming in from the various products all the time instead of having to wait twelve months before, perhaps, receiving anything worth mentioning.

Mixed farming is good farming, and prevents, when judiciously carried out, any deterioration of the soil—on the contrary, improving it all the time.



The Horse:

THE HISTORY, DEVELOPMENT, CHARACTERISTICS, AND FUNCTIONS OF THE ENGLISH HACKNEY HORSE, WITH SHORT NOTES ON COACHERS AND TROTTERS.

A Lecture delivered by Mr. W. T. CHARLEY, Manager of the Belmont Park Stud, at a meeting held at Clarendon Show Ground, under the auspices of the Hawkesbury District Agricultural Association.

A FINE collection of pictures of horses was shown by the aid of the lantern by Mr. H. W. Potts, Principal of the Hawkesbury Agricultural College, assisted by Mr. G. Marks, Instructor in Agriculture at the College.

Mr. Charley said: Before proceeding with the main subject of the lecture that has been set down for your hearing to-night, I think it would be expedient to take a look over the bones that go to make up the structure of the horse's body, in order that what will be said about the general conformation and points later on might be better understood. It will be a very short glance, however, and I shall endeavour to make it as simple as I can, and during its treatment will point out the seats of the more important bone diseases. Bones consist of about one-third animal matter and two-thirds mineral matter. The greater part of the mineral matter is made up of phosphate of lime, which provides the phosphoric acid so necessary to the growth of farm crops. Now, the quantity of animal matter in bones may be varied to some extent according to the nature of the food of the animal; and if the breeder of horses wishes to have animals possessing a good quality of bone, containing a maximum amount of mineral as against animal matter, he will see that his stock is reared on rich pastures overlying geological formations in which the limestone element is strongly in evidence. Soft bones in horses, while being due in some degree to hereditary tendency, are largely the result of the young animals being reared on soft pastures containing an insufficiency of mineral matter. It would be well to remember that it is only by being well acquainted with the structure and anatomy of the horse that we can appreciate his shape and uses, or understand the different diseases to which he is liable. (A skeleton of a horse was here given with the lantern, showing the more important bones, ligaments, and tendons, and indicating the seats of the more important bone diseases; centre of gravity explained; short note on muscles—their functions, &c.; levers of the limbs.) It will readily be seen that the hock joint and the bones below it form a series of levers. The fulcrum is represented by the portion of the joint where it articulates with the distal end of the tibia. The power is supplied by

the muscles of the thigh and gaskin acting on the os calcis, and the weight is expressed by the foot and its friction with the ground with the weight of the hind quarter thrown into it. Thus it is seen that the longer the os calcis is in proportion to the cannon bone and fetlock joints, the greater will be the mechanical advantage to be obtained, provided the muscles above are in a condition to avail themselves of it. Care must, however, be taken to view the physical and mechanical proportions of these phenomena side by side; for if we have a long os calcis and a set of very powerful muscles acting upon it, the possibility is the hock joint will not be able to withstand the strain, and a rupture of the ligaments which connect the hock bone to the lower bones on the leg at the rear will take place, with the result that we would get what is called a curbed hock. Hence it is that we must endeavour to get the length of the os calcis in conformity with the strength of the muscular contraction which acts upon it.

Trotters.

Of all the domestic animals with which we have to do there is none more noble nor more beautiful than the horse. He is associated so much with our work and pleasure that he is the object of almost universal esteem. Few persons there are that do not claim some knowledge in the matter of horseflesh. The picture of Darley Arabian, which was shown on the screen, represents the father of our most inestimable breeds of British light horses. Darley Arabian is the horse to whom our noble breed of thoroughbreds trace their lineage, and it is to him, more or less directly, that we owe our modern trotting and present day hackney horses. We shall see later the manner in which this evolution has been brought about.

American Trotters.

Sixty years ago the American trotting horse as a distinct breed was unknown; and one that could trot a mile in 3 minutes was considered a wonderful animal. The American people very soon acquired a love for trotters, and after the initiation of the breed little time elapsed before the boom in this class of animal became rampant, and breeders lost no time in endeavouring to perpetuate it. The American trotting horse had its origin in Norfolk, England, where, towards the end of the 18th century, it went under the name of Norfolk Trotter. The initial step in the formation of the breed in America was in the year 1788, when Messenger, an English thoroughbred, was imported into that country. It was largely through the blood of this horse that the famous Rysdyk's Hambletonian came into existence, although his trotting inheritance is said to have been given him by Bellfounder, a Norfolk trotter, which was said could trot 17 miles in an hour, carrying 14 stone. Bellfounder was imported into America from England in the year 1820.

Rysdyk's Hambletonian is looked upon as the great modern progenitor of fast trotters, and is said to have got his peculiar shape from Bellfounder. Authorities on the American trotting horses state that

Hambletonian was foaled in 1849, and began his career as a humble and obscure stud horse. The unpretentious manner in which this horse was regarded in his younger days is shown by the fact that his breeder, a cattle drover, sold him to a farm labourer named Rysdyk, in the same year as he was foaled, the colt and his dam together bringing the modest sum of £25. Thirteen years later his owner raised his stud fees to above £7, on the performances of one of his sons, known as George Wilkes, who put up the trotting record of 2 minutes 22 seconds for the mile. In that year the son of Hambletonian was matched against the then famous Ethan Allen for £1,000 a-side, and won a great race, the time being 2 minutes 24¾ seconds. After this came Dexter and Shark, both sons of Hambletonian; then Goldsmith's Maid; and with all four trotters going at once the great Hambletonian boom began. The stud fee of this great horse, which in 1862 was £7, jumped to £15, then £20, £30, and £100 per mare in successive seasons, and his colts commanded prices never before heard of for horses of any class in America. This grand horse died in 1876, at the mature age of 27 years, after having been responsible for over 1,300 foals. Forty of his progeny gained records of 2 minutes 30 seconds or better; 150 of his sons sired 1,478 standard trotters, and eighty of his daughters produced 110 trotters in the 2.30 list. The achievements of the succeeding generations of the family have been rewarded with still greater success, for it has been estimated that 15,000 of the 17,625 trotters on the 2.30 list are descended from this remarkable horse. It is significant also that every trotter except one that has lowered the world's record has been possessed of Hambletonian blood. At the close of the campaign of 1901, 135 out of the 138 trotters who won records of 2.10 or better traced their lineage to this fine animal. Hambletonian earned nearly £58,000 at the stud. It is somewhat a remarkable fact that this Father of the American trotting breed was not himself a fast trotter, and it is said that his best trotting gait could not exceed 3 minutes 15 seconds to the mile. We see in this horse a striking instance of the dormancy of inherent qualities supposed by some people to take place occasionally in the breeding of live stock, and the case of Hambletonian has its analogy in the close progenitors of the famous English racehorse Eclipse.

Marsk, the sire of Eclipse, was sold from the Duke of Cumberland's stud for a mere trifle, and was allowed to run almost wild in the New Forest. He was afterwards purchased for 1,000 guineas, and before his death his stud fee was 100 guineas per mare. Squirt, the sire of Marsk and grandsire of Eclipse, was ordered to be shot, and while he was being led to his doom he was spared at the intercession of one of his owner's grooms.

Hambletonian is said to have been possessed of remarkable muscular development, with low wither, which appeared to sink into his shoulder blades. We see in this horse the character of a noble animal. The determined head, mild prominent eye, and well-set on ears speak volumes for his capacity of transmitting to his offspring those excellent qualities

which, although lying latent and concealed in himself, were so potent in the establishment of our modern breed of American horses. Truly, this was a wonderful horse, which justified his claim in being called a hero of trotters.

Another head of the various trotting families was Mambrino Chief. Then come American Star, Clay, Pilot, and others. Mambrino Chief, who was by the imported Messenger, was foaled in 1844, and died in 1861. Thus it is that the American trotters, possessed as they are of the gift of moving at a high rate of speed, originated from what we might call a variety of animals little removed in their characteristics from light harness horses. By careful selection, keen observance of the laws which govern the principles of breeding, and intelligent and persistent training, the speed has been rapidly increased from a 3-minute gait in 1806 to one under 2 minutes in 1905. Firm, elongated muscles exhibiting a minimum of fatty tissue, long tapering neck, well set on head, oblique shoulders, short back, good croup and hips, well let down hind-quarters, and good lengthy limbs are points to be observed in a well-bred trotter. The turning out of the toes in front, which is seen in so many of the best trotters of the present day, would be considered a serious defect in horses that are required to perform ordinary work; but the fact that this conformation has been acquired, and has attended the development of the trotting gait, makes it appear that it is a characteristic peculiarly associated with this variety of speed. All the old-time trotters, Hambletonian included, did not possess this peculiarity, and this fact strengthens the suggestion that these conditions were acquired during the evolution of the fast trotting movement.

Pacers.

It was formerly supposed that there was a difference in the general conformation of trotters and pacers; but observance of the points of horses which possessed these different gaits proved that there is practically no material distinction in the shape of the animals which own them. The mode of progression, however, is so entirely different in the two varieties that a division of them, both on the track and in the show ring, is amply justified. The tendency of pacers is to have shorter backs than trotters, and the risk of "interfering" or "hitting" is much less in the former than in the latter.

Coachers.

The breed of horses that commonly go by the name of Coachers has its origin in the variety called Cleveland Bay or Chapman Horse. The source from which the original Cleveland Bays were derived is enveloped in a certain amount of obscurity. Some theories have been advanced that the Clevelands were produced by the mating of thoroughbred sires with the original cart mares of England. Other authorities assert that the Cleveland Bay contains none of either the racer or the cart horse, but is a pure breed of horses which was bred in the fertile district which bears its name, and is situated in the North Riding of Yorkshire. Let these

theories be as they may, it is an undoubted fact that the Cleveland Bay or Chapman Horse has been looked upon as a pure breed for generations. From father to son, in the dales which became its home, this tradition has been handed down. Support of this view is forthcoming in the present day by the striking manner in which the members of the breed possess the capacity for maintaining their type and transmitting their various characteristics to their progeny, which proclivity is the surest indication of pureness of blood.

Cleveland Bays may be divided into three great families, to one of which every pure horse of the breed should trace his lineage. These are the descendants of horses called Dart, Barley Harvest, and the Hob Hill Horse. From these three heads our modern Cleveland Bays have been derived. The older types of the breed were somewhat fleshy-boned animals, with legs clean of hair. Their colour was universally bay, with black points, and the height 16·2 hands. In bygone days this breed of horses was largely used for light farm work, for which occupation they were admirably suited owing to their unique combination of strength and activity. They were the basis of the breed of the old London coach horse. Recent demand for a lighter class of coach horse has resulted in the production of the Yorkshire Coacher, which is an improved form of the Cleveland Bay, and has been brought into existence by the use of the English blood horse on the Cleveland Bay. The effect of this system of improving the breed has resulted in the maintenance of the chief characteristics of the original variety and the production of a higher quality of fineness.

This Yorkshire Coacher is the most modern form of English coach horse. His colour must be altogether bay, with black points; should stand well up to 16·2 hands, on good sound legs, be possessed of soundness of wind and limb, and have good muscular development. His chief function lies in the production of high-class carriage horses, the long arching rein, and good hind-quarters, well-set-on head and tail, and fine, straight, aristocratic action making him particularly valuable for this purpose. His temperament is mild, and he lends himself kindly to domestic treatment. As a pure-bred he is not a great success for riding; but his grades from lighter mares make good saddle horses and hunters, and also good horses for ordinary harness work.

For the production of army remounts from light blood mares he possesses qualities that contribute largely to that size of bone and substance so necessary in these kind of horses.

Dual-purpose Horse.

In speaking of the points which guide good judges of horses, I propose to explain, as briefly and simply as I can, those fundamental principles upon which usefulness and beauty depend. We require one class of horse for speed and another for draught; and we also want an animal in which may be found a combination of these two properties. In such an animal we require conditions that, while a fair amount of speed is

obtainable, the power of traction is also retained in proportionate quantity; and in tracing out the points of the dual-purpose horse we find that, instead of the short-backed, fine-barrelled, lengthy-limbed conditions so necessary to the production of a high rate of speed and antagonistic to the requirements of draught, we get the midway existence of a thick-set, heavy-limbed body standing on comparatively short legs.

We shall now consider some of the necessary attributes which conduce to speed and draught in horses; and this knowledge may be used as a guide in determining the conformation and points of horses suitable for both riding and driving. The two extreme properties of speed and draught could not be more amply demonstrated than in the thoroughbred and draught horses. We find in the draught that the thighs are shorter and thicker in comparison than in the thoroughbred, since the muscles in that region are not called upon to perform the lengthy contractions that are so necessary in racers in extending the hind limbs during the fast gallop. The width of gaskins and length of the os calcis, however, should remain fairly constant for both saddle and harness horses, for it is by the physico-mechanical effect of these parts that propulsion of the body is brought about. The necessity of good, clean, large hocks is emphasised by the fact that in galloping the weight of the forepart of the body is raised by the contractile power of the muscles of the thigh acting directly on the hock joint. The same thing happens when an animal has a load to draw, except that, instead of the fore-quarters being lifted off the ground, the force from the hock is transmitted as near as possible through the centre of gravity of the body to the front surface of the shoulder upon which the draught collar rests. In order to obtain the greatest maximum of speed, the hind limb should be hung in a more or less vertical position from the hip joint, so as to obtain the greatest possible extension of the limb backwards, and thus enable the animal to cover the greatest amount of ground in the direction he is moving. For draught purposes this is not so important, since it is power that is required, at the expense of speed. For speed, the muscles of the hind limb should be long, and not necessarily heavy, and free from that cellular and fatty tissue which, besides increasing the weight and intensifying friction, would not assist in the production of a high rate of movement. The reason for length of muscle being conducive to speed is found in the greater length of the contraction effected by a long muscle as compared with a short one. For draught, the thickness of the muscles is of more importance than the length, seeing that slow propelling power is required and speed little taken into consideration. For this class of work, therefore, the thigh should be massive, and covered with ponderous muscles—quite an opposite condition to when speed is required.

For racing, the hip joint should not have a too drooping tendency, for such a condition seriously interferes with the backward sweep of the hind leg; but for draught, this peculiarity is admitted to a certain degree, and indeed indicates a mechanical advantage by transmitting

more directly the propelling power generated by the muscles of the hind-quarter towards the shoulder. A horizontal croup is an indication of speed and beauty in the thoroughbred; but in the draught, the crouching position taken up when a heavy load is to be moved is easier attained when the tail is not set on too high. A drooping pelvis, however, is not a serious defect in polo and stock horses, since these class of animals are frequently required to turn about very quickly and set off in an opposite direction. This position of pelvis is well adapted to animals getting their hind legs well under them quickly, stopping and turning round sharply, and starting off again in an opposite direction in the shortest space of time. Care must be taken, however, to avoid extremites in this respect, and to refrain from the unsightly conformation when it takes the form of "goose rump." The pelvic bones in the racer should be narrow and long, in order to provide a seat for the long muscles that are necessary for fast speed; but in draught horses, breadth of this portion is advisable to admit of a greater mass of shorter-actioned muscles. The fore limb in gallopers, like that of the hind limb, should be long, to allow of a long reach. The shoulder should be long, oblique, and flat, running well back, and disappearing into the withers at the upper end, and terminating at the lower extremity in a well-covered joint with the humerus. It should not be too heavy, for the strain on the fore legs would be increased by the superfluous muscle, and the speed and staying power of the animal would thus be interfered with by the additional weight. The front of shoulders should show an almost imperceptible union with the neck.

In the draught horse, long shoulders are just as necessary as in the galloper, but the slope need not be so great; and this point is dependent upon the direction of the force acting upon the collar during the action of draught. Sufficient slope should, however, be evident so as to allow freedom of action to the fore limb, both in the walk and the trot. The shoulder blade should be well covered with massive muscles, so as to enable a maximum of power to be exerted when a load is to be moved. The union of the shoulder with the neck in draught horses should be more abrupt than in thoroughbreds, so that a good seat for the collar is formed by the front surface of that organ. Gentle insinuations of neck into shoulder, while being a point of beauty, and conducive to speed, is not to be encouraged where horses are used for draught purposes. High withers, well-set back, are commendable points alike for speed, draught, and beauty, for, while assisting in the encouragement of long, sloping shoulders, they are usually associated with good carriage of head and neck, and, by virtue of the greater surface they present for the attachment of the muscles which, in some degree, control the movement of the shoulder, and also by affording greater attachment for the muscles of the back, they are very material in conducing both to the production of fast movement and heavy traction. Low withers are usually possessed by animals having short upright shoulders—a condition that should be carefully avoided.

It seems probable that the angle that is formed by the position of the humerus with the shoulder blade is fairly constant in the different varieties of horses, and does not show any very great amount of variability. This region should be ponderous and heavy in the draught, and comparatively lighter in the racer. The fore-arm should be broad in both classes of horses, in order that plenty of muscle might be insured to enable the limb below the knee to be readily flexed and extended. The knee should be broad and flat in front, and free from fleshiness.

The neck of the galloper should be long and slender as compared with the shorter and more massive neck of the draught. What has been said of the muscles of the thigh applies in this case to those which are connected with the neck and shoulder. In horses of speed they should be long, to admit of a greater extension of the limb, and render the ability of the shoulder to be brought well forward in the gallop; whilst, where greater strength is the objective, shorter and thicker muscles may be substituted, and thus a more massive neck provided for the draught. The crest in racehorses must not be more massive than is sufficient to indicate his sex when the animal is not in training. In draughts, however, the crest can hardly be too massive, for, by the extra weight provided thereby, the centre of gravity of the animal is brought forward, and power of traction thereby facilitated.

The breast of the galloper should be comparatively narrow. Any undue width between the fore-legs and shoulders is antagonistic to speed by the extra weight to be carried and the increased resistance effected by the air when the animal is going at a high rate of speed. Width and massiveness of this part, however, are essential in the draught horse, in order that the weight may be thrown well over the centre of gravity whilst the animal is in the act of performing traction. The weight and massiveness of the fore-quarters have a material effect on the position of the centre of gravity. Where these parts are very heavy in comparison to the hind-quarters, the centre of gravity is in a more forward position than where the hind parts are heavier than the fore; consequently, animals whose function it is to throw the bulk of their weight into the collar should have a heavy fore-hand, whilst those whose mode of progression is affected by raising the fore parts during the action of galloping should have their centre of gravity set back in order that the strain on the hind-quarters and loins may not be too great. Thus, we must look for greater bulk in the fore part of the draught horse than in the galloper.

The chest in all breeds of horses should be wide, deep, and round, and ribs well inclined to the rear. These conditions are necessary to ensure efficient breathing capacity and staying power.

The lower line of the chest towards the abdomen should be nearly horizontal to the ground. Any undue inclination upwards of this line is an indication of want of power of endurance.

The abdomen in racehorses should be round, and not too full. Too large an abdomen seriously interferes with speed, by exciting an undue

pressure on the lungs, and thereby affecting the breathing capacity. Where speed is not required, this part of the body may be more fully developed.

The back and loins of all horses should be short. On first thought, a long back gives us the impression that such a condition is conducive to speed; but on reflection it is found that such is not the case. Undue lengths of back and loins are generally associated with soft "herring-gutted" animals, and necessitates the expenditure of much more muscular energy in raising the fore-quarters than when the distance from the withers to the croup is short. The top line should incline slightly towards the croup, and, passing over this part, should continue in a gentle downward sweep to the tail. Short back and loins are also necessary where weight-carrying power is required.

The loins should be short, flat, and broad. A slight convexity might be admitted, but a tendency to roach and hollow backs should be carefully guarded against.

Breadth of loins is a very important point in all classes of horses, for it is over this region that the strongest and most powerful muscle in the body is situated—the long, broad muscle which extends from the pelvic bones to the last three or four bones of the neck, and the action of which is responsible for the raising of the fore part in galloping, jumping, and rearing, and for lifting the hind-quarters during the action of kicking.

We have already noticed the bones and tendons of the leg from the knee and hock down to the ground. Suffice it to say that, in proportion to the kind of work the horse has to perform, so should the size and shape of these appendages be regulated.

From the foregoing, then, and in recapituation of the conditions which separate blood horses from draughts, we have seen that lengthy limbs, with long lean muscles and short back, are points that conduce to the attainment of speed, whilst comparatively short limbs, with short, thick, massive muscles, are factors which indicate strength.

A combination of these two qualities in one animal leads up to the production of the dual-purpose horse—that is, a horse possessing a fair amount of both speed and draught powers.

There is no breed of horses which fulfils the office of the dual-purpose horse in a more efficient manner than the English hackney and its grades.

An inquiry into the history and development of this breed of horses will take us back into about the middle of the 18th century, and will convince us how, in those early days in the history of British breeds of horses, the hackney has issued from the same source as the English thoroughbred and American trotter of the present day.

In the year 1755 a horse called Shales was foaled, and to this animal all the best hackney blood stock traces its lineage. Shales was out of a hackney mare, and by a horse called Blaze. Blaze was by Flying Childers, and Flying Childers was by Darley Arabian—that noble animal that has justly been called the hero of the British breeds of light horses, and who

was imported into England in the year 1706, having been bred on the plains of Palmyra. Now Blaze was a thoroughbred (so far as thoroughbreds went in those early days); and, having got Shales, the early progenitor of the hackney breed, got also a horse called Sampson, to which Mambrino, the racer and trotter, and his son Messenger, the ancestor of American trotters trace back. We have seen that Messenger was imported into America in the year 1788, and that he was responsible, on the sire's side, for the existence of Hambletonian, the father of the modern American trotters. Thus it is that this thoroughbred horse, Blaze, was the sire of both the hackney and trotting breeds of horses, and that he himself, tracing back through Flying Childers to Darley Arabian, it follows that all three breeds sprang from a common source.

It is said that the trotting element in Norfolk horses was in a large degree due to Dutch horses, which were imported into Norfolk in the early days of the history of the breed. Holland was at that time famous for its trotters. Thus we see that about 150 years ago Norfolk possessed a breed of horses in which a combination of thoroughbred and trotting blood was evident. The blending of these two qualities in the one animal resulted in the production of horses possessing a combination of speed and weight-carrying power (for in those days vehicles were very little used).

Breeders, becoming alive to the conditions which surrounded this breed of animals, and seeing in them potentialities that were not apparent in other varieties, set to work to evolve a class of horse that, in addition to being able to carry heavy weights, could also maintain a good rate of trotting and galloping speed.

The sporting element so inherent in men of British blood having already begun to assert itself, road races were run, and stakes competed for, in which both trotting and galloping horses took part in their respective classes, weight-carrying power being one of the considerations which determined the contests. The results of these competitions soon made themselves manifest; and the old Norfolk breed of horses, with its combination of various kinds of blood, became split up into two distinct varieties, one being the progenitors of the modern thoroughbred, and the other of weight-carrying trotters.

The sporting tendency of the country still displayed increased vigour, for intensifying the speed of the trotting element made itself responsible for a further splitting up of the breed. Mares possessing the greatest tendency for producing a higher rate of speed were mated to sires possessing like qualities, with the result that the foundation was laid for the production of our modern trotting horses; whilst animals that showed a strong inherent capacity for going long distances on roads at a fair rate of speed, and carrying heavy weights, were mated together to form the progenitors of the hackneys.

Thus we see how, by the intelligent and judicious use of artificial selection in the early days of the history of English horses, three varieties of animals were evolved from a common source, each possessing distinct characteristics peculiar to themselves.

As time went on the Norfolk trotter, or roadster, as the breed was then called, was subjected to frequent infusions of thoroughbred blood on the side of the mares, in order to fine down the breed, and to place them in conformity with the ever-changing conditions that were being brought about by the advent of steam railway traction and the consequent diminishing demand upon the breed for the necessity of the heavy road work they had been accustomed to perform.

Thus, then, from one original source there have been two bifurcations. The first offshoot was the progenitors of our English thoroughbred, leaving the Norfolk trotter or roadster to represent the main trunk. Then came the division of the latter into two branches, the one being that which was responsible for our modern trotting horse, and the other the antecedents of the hackney breed.

The demand of fashion to supply stylish, thick-set, high-actioned horses, suitable for high-class park work, soon became conspicuous, and efforts were directed upon these hackney horses to satisfy the claim, with the result that we have these characteristics deeply inherent in the true hackney breed of horses of the present day. Colour did not seem to play a very important part in the establishment of the breed, and horses of nearly all colours were found in this breed of animals, breeders taking full advantage of the axiom that "a good horse is never a bad colour." It is noticeable that a great many of the best horses of the breed were chestnuts. Efforts have been made in recent years, however, to produce hackneys in which the popular bay colour will be indelibly stamped.

Now, a good deal of misconception exists in connection with the meaning of the word "hackney." The popular acceptation of the word is an animal suitable only for riding. I have experienced difficulty from time to time, when judging horses at some of our agricultural shows, in making myself understood to my co-judges in the matter of what the qualifications of a hackney really should be, so strong is the association of the word with a purely riding horse; and it is hard to convince those who are not conversant with the breed that such an animal, besides having good qualities for saddle work, should also possess the conformation which adapts itself to the requirements of harness duties. If we turn up an authentic dictionary, and look for the meaning of the word, we find that hackney means "a horse for riding or driving"; that is, a saddle or harness horse—a dual-purpose animal. The popular Australian acceptation of such an animal is roadster. The correct nomenclature of this breed of horses, however, is hackney, and means a horse suitable alike for riding and driving. If we criticise closely the points of this horse we shall see that the blending of speed and draught has been uniquely fixed. We see in this horse that the fine intelligent head of the thoroughbred has been maintained. While the neck has been slightly shortened and thickened, with an increased crest, sufficient length has been left to ensure good character and fair amount of speed, and the flexibility of that part—a point which is so important in riding horses—has remained fairly intact. The high withers and sloping shoulders of both

the racer and the cart horse still remain, the shoulders and breast having been thickened in proportion to the amount of harness work the breed has been called upon to perform.

The depth and width of the chest have been upheld to provide the necessary lung power, and the shortness of back and loins have been maintained to justify the weight-carrying power and traction that are so characteristic of the breed.

The underline has become more horizontal than in bloods—a peculiarity necessary to the production of staying power and draught.

The elongated pelvis and the more or less horizontal croup, which are so essential for speed, have blended with those conditions which, whilst conducing to the maintenance of the capability of horses for harness work, have not been allowed to degenerate into the "goose rumped" conformation. The lateral width of these parts has also been increased, and a midway condition, suitable for both saddle and harness work, has been produced. The thighs are thicker and more massive than is seen in the blood horse, and the thigh bone shortened in a degree that is necessary in this dual-purpose breed of horses.

The width of the gaskins and fore-arms have been preserved, and the hocks and knee-joints compelled to maintain their proper size and conformation.

From the knees and hocks to the ground the bones and tendons partake of the shape, quality, and size that weight-carrying power, speed, draught and high-stepping action have demanded of them.

Generally speaking, then, we have a conformation in the hackney breed of horses which fills the eye of even the most casual observer, with a short, thick, rectangular form of body, set upon short, well-shaped legs, and an animal in whose very existence gleams forth that characteristic quality which determines and distinguishes all animals in whose blood the efforts of man, in his intellectual capacity for breeding to a purpose by artificial selection, have been crowned with success.

Functions of the Hackney.

Now, we have in Australia conditions of soil and climate that in an extraordinary degree are suitable for the production of all classes of horses—conditions, I venture to say, that are not obtaining in a higher degree in any other part of the world. Extremes of heat and cold are potent factors in the degeneration of type in all classes of live stock; and we find it particularly so in the case of horses. The fact that India has been unsuccessful in her horse breeding is sufficient evidence of the effect of extreme heat on the efforts that were put forth by the Government of that country to produce her own cavalry and artillery horses.

Notwithstanding the constant importations from England and Arabia of fresh blood, India has had to largely depend on Australia for horses to supply her army remounts; and the knowledge is patent to all that the superiority of our Australian horses over those of other countries

has been well exemplified both in India and the late South African war. Ample evidence in the diminution of the size of the horses bred in Iceland, Shetland Islands, and Mongolia conduces to the fact that the effect of extreme conditions of cold also render the production of size an impossibility. In Australia we have a temperate climate and good soil; and these conditions admit of the production of a wide-ranging variety of horses.

In the drier districts to the west of the range of mountains which runs north and south, parallel to the sea, on the eastern side of our continent, horses can be bred possessing stamina, substance, endurance, and hardiness of constitution second to none in any other part of the world; whilst on our coastal areas the heavier varieties of draughts can be produced in their most excellent form.

Australian horses are fast acquiring a distinct type of their own—one peculiar to the conditions of soil and climate in which they have their environment; and it only needs the careful intelligence of our breeders to put into practice the benefits that are held out to them from Nature's bountiful store in order to evolve breeds of horses the like of which would surpass even the efforts of the most successful breeders of England of the present and bygone times.

The chief function of the hackney sire is found in his adaptability to the production of almost any kind of light harness or saddle horse, and the degree in which he asserts his usefulness in this respect will be dependent on the class of mare with which he is mated.

There is always a good market in India for horses suitable for army purposes. The Indian Government require in their purchases animals possessing plenty of substance and weight-carrying power and good bone alike for cavalry and artillery work. Here the use of the hackney sire is put to its greatest economic value. From light mares of any breed the result of the mating is rewarded by horses suitable for mounted troops; and from active draught mares the product is eagerly sought after for artillery purposes. For riding and driving, the hackney crossed on blood mares leaves progeny that, whilst fulfilling all the conditions required of them in their ordinary work, have the additional property of possessing that fine stepping action and surefootednesss that is so characteristic of the sire.

Excellent farm horses are produced by mating the hackney and draught together. The result of this cross takes the form of animals suitable for fast movement, combined with strength. One of the conditions inseparable from successful farming now-a-days is that the work must be done cheaply and in the least possible time, in order that the farmer may issue prosperously from the web of the keen competition with which our present-day primary industries is woven.

The hackney draught cross is also a very suitable animal for use in such vehicles as spring vans and lorries, by virtue of their combined strength and activity.

It is to be regretted that the upkeep of the stamina and usefulness of our draughts and general utility horses is mainly a one-sided matter. Breeders would do well to bear in mind that there is a never-ceasing natural law always in operation in connection with the breeding of live stock—the transmission of acquired properties. Were it not for the fact that farmers make use of their mares in carrying on their farming and other domestic operations, our breeds of draughts and harness and saddle horses would in time become so wanting in their capacity for work as to render them practically useless as beasts of burden. The stallions of these varieties are usually kept year in and year out without performing any kind of physical labour outside the ordinary exercise that is necessary for the maintenance of their bodily health. Their capacity for work consequently leaves them, as a natural result, their muscular development is retarded, and their muscles and bones become grossly impregnated with fatty and cellular tissue. These conditions having been acquired, in time fix themselves as inherent properties, and, in obeyance to the law, are transmitted to their offspring, with results that are too obvious to require explanation. Agricultural societies would provide a boon to our horse-breeding industry if they would look into this matter and place awards in their prize schedules for stallions in harness. In bloods and trotters this matter is to a greater extent obviated by the encouragement of horse racing by the public; but even in these, more might be done in the way of encouraging long distance and weight-carrying events.

Forestry.

Notes on Western Timbers.

Mr. R. J. Dalton, of Tingapagee, Wanaaring, Paroo River, furnishes the following notes on western timbers and trees, to supplement Mr. Maiden's notes on the uses of timbers in the April, 1906, *Gazette*.

Wherever necessary Mr. Dalton has had the kindness to forward botanical specimens to Mr. Maiden, so that the botanical names of the trees referred to might be given.

Some of the trees had been omitted by Mr. Maiden because of their relative unimportance, but a point should be stretched in regard to western timbers.

1. *Supple Jack or Australian Willow (Ventilago viminalis).*—Good firewood, bullock-yokes, and shafts, but hard to get straight; also good fodder for stock. Resists white ants.
2. *Grue or Mallee Apple (Owenia acidula).*—Good for bullock-yokes and sheep fodder; also a very ornamental tree, but a slow grower.
3. *White-wood and Leopard-wood (Flindersia maculosa).*—Good for sheep fodder, and sometimes used for shafts. Makes good tables when sawn and well seasoned, but subject to boring insects. Ornamental tree; will stand lopping. Very good for mallets.
4. *Kurrajong (Sterculia diversifolia).*—Not much growing here, and seems to be different to the inside (coastwise) timber, as it has an ivy leaf and is darker colour. Does not grow high, but spreads, and very dense. I have a tree growing in the yard, the seeds of which came from inside, and it is about 15 feet high and 15 years old; while some of the local trees which I have transplanted have only grown 12 inches in seven years; they were about 12 inches high when transplanted.
5. *Gidgee (Acacia Cambagei).*—Is much used for posts, and lasts well; also a first-class firewood, being as good, if not better, than Mallee roots. The white ash is sometimes used for whitewash. It also makes good picture-frames and walking-sticks, especially if ringed.
6. *Mulga (Acacia aneura).*—Our great stand-by; is one of the best for posts, shafts, best charcoal, but not much good for firewood. Should make good railway sleepers; and, taken all round, is one of the best and most useful western timbers, but does not grow to any great size. It makes very pretty walking-sticks and picture-frames; sometimes found with rings in it.

7. *Ironwood* (*Acacia excelsa*).—There is also a tree growing here which grows in the butt to a good thickness, and is evidently of the Acacia family, and is called the Ironwood. It is very hard to chop, but is of no use for fencing-posts or outside work, as it has only a few years' life. It is a very good firewood, and splits well.
8. *Nidgya, Nelia, or Black's Medium Tree* (*Acacia Oswaldi*).—This is held in great superstition by the blacks, which I think is on account of a peculiar habit it has, and which I have only observed twice in twenty-three years, which occurred in the very dry years of 1889 and 1902. A kind of sap oozes out of the bark and leaves in such quantities as to give the ground underneath an appearance of being covered with water, and the bush a shining appearance in the sun. It seems to me to be a close relation of Gydgee, as the leaves and bark are very similar in appearance.
9. *Bloodwood* (*Eucalyptus terminalis*).—Used for fencing-posts, house-blocks, rails, flooring-boards, and is good for charcoal. It should be useful for railway sleepers.
10. *Yappunya or Kappundya* (*Eucalyptus ochrophloia*).—Is a very useful timber for shafts, under-carriage of drays and waggons, and any heavy work; also good for house-blocks and posts. Some posts I know of have been used about forty years in a stockyard, being once shifted when about twenty years in first yard, and at the present time quite sound. It is a very close-grain wood, and will not break, but splinters. It is hard to get straight, as it grows very crooked. A good, fine wood, as it burns away to ash and leaves no charcoal. I have a picture-frame made from ring kappunya, which is very much admired.

11 and 12. *Box-trees*.*—There are several varieties of box; some are good for all kinds of work, while others, especially—
   1. A kind which we call Swamp or Black Box is very indifferent, not even being good for firewood. This is *Eucalyptus bicolor*.
   2. There is a white, soft kind which grows on the river banks, and is generally called White Gum, which is a most useless timber; if used as fencing-posts it will last about three years. It is about the straightest-growing timber about here, and would be of great service if it were good; should be suitable for lead-pencils. This is allied to *Eucalyptus populifolia*, the Bimbil, and perhaps a hybrid or other form of it.

13. *Beefwood* (*Grevillea striata*).—Very useful, as stands well in ground. Have used it for house-blocks, posts, furniture, strong flooring, well-slabs, picture-frames. It is not much good for bullock-yokes, although extensively used, as it is very liable to split. It should be very good for railway sleepers, as it lasts well in the ground. Have also seen it used for roofing-shingles, as it is a fine splitting wood. No good for firewood.

* Usually called "River or Swamp Box."—J.H.M.

14. *Corkwood* (*Hakea sp.*?—twigs sent, but fruits asked for).—The best timber for bullock-yokes, and is far superior to the Oak which comes from inside districts; no use for anything else.
15. ***Belah or Bull Oak*** (*Casuarina lepidophloia*).—Good for firewood; sometimes used for bullock-yokes, but liable to split. No use for post or outside work.

In pointing out that "Belah" and "Bull Oak" are really different trees, Mr. Dalton states: "The Belah is always called about here by the name of Belah, and, except for firewood, is of very little use. The only times I have heard it called Bull Oak is by people coming from inside districts."

16. *Cypress Pine* (*Callitris robusta*, R.Br.), which I have used, and find it is of very little use for house-blocks, as it is subject to dry rot; but will withstand white ants, and is good for flooring-boards and house-building, when not exposed to the weather or damp, the house being built on blocks. Have also used it for wire-mattress frames, 3 ft. x 2 ft. doors, lining boards (it polishes well), picture-frames.

The best three timbers for firewood are Gidgee, Ironwood, and Belah, all of which will burn or smoulder to white ash, even if green. Mulga is good if a finer, quick heat is wanted. Box timber only good when dry. Of course, Grue and Supple Jack are also good, but they are not plentiful.

Charcoal.—The Mulga makes the best charcoal; but some blacksmiths prefer Bloodwood and Box.

Export of Oranges from Pera Bore.

W. J. ALLEN.

In order to test the carrying quality of oranges grown in the interior of this State, it was decided to send a few cases of those grown at the Government orchard, Pera Bore, near Bourke. This orchard depends, as is well known, upon an artesian well for the supply of water necessary for irrigating purposes throughout the warmer months of the year. During the winter the rainfall generally gives sufficient for its needs.

The soil in which these trees are growing is a red sandy loam, in places very hard and almost devoid of humus, and the ground after each irrigation sets very hard, unless it is worked up as soon as it is dry enough to go upon, when, if the water has not been allowed to escape from the furrows, it can be kept in very fair condition.

Up to the present we have been able to secure sheep and stable manure from the farm and adjoining station, of which the trees have received two applications. It is often contended by citrus fruit-growers that such manure makes the fruit grow coarse and of inferior quality; but according to the report from London there is no complaint made as to the quality of this fruit, but on the contrary, they claim that it is some of the very best fruit they have seen on that market.

The fruit was picked and packed the same day, being wrapped in ordinary fruit-wrapping paper, and then packed in cases, wood-wool being used to fill up all the interstices.

It is gratifying to obtain such satisfactory reports from the different firms, as well as from the Agent-General, as to the way in which the fruit carried, the quality, and its handsome appearance; but it appears to me that if the people in the old world want such fruit they must be willing to pay more than 1s. per dozen for them, as they sell readily, not only in Sydney, but also in our country markets for almost double that price.

If we should ever produce more fruit of this quality than is required to supply the local demand, it is encouraging to know that there is a good demand for same at prices at which it would pay to grow them.

Oranges per R.M.S. "Macedonia."

Offices of Agent-General,
123 and 125, Cannon-street, London, E.C.,
19 October, 1906.

Sir,

I have the honor to forward, for the information of the Honourable the Minister for Agriculture, the following report furnished to me by the inspector of my department. * * * The oranges shipped per R.M.S. "Macedonia," and referred to in the letter of the Honourable the Minister for Agriculture, arrived in perfect condition. I at once took steps to have them brought under the notice of the leading fruit merchants in London, and also to display them suitably in our city window.

The arrival of these oranges in such perfect condition reflects great credit upon those who packed them, and I should like to convey to the Honourable the Minister my sincere thanks for the assistance rendered to our work by his Department in forwarding these and other such excellent exhibits.

I have, &c.,
T. A. COGHLAN.

[Memorandum.]

Oranges per S.S. "Macedonia."

As directed by you, I have brought the oranges under the notice of the principal buyers at Covent Garden and Monument markets. I have just returned from the Monument Fruit Markets, and both there and at Covent Garden the oranges shipped by the Honourable the Minister for Agriculture, Mr. Moore, from Pera Bore, have attracted great attention and most favourable comments.

Messrs. Keeling and Hunt will furnish a full report in time for next mail. There are so many matters of interest in connection with the shipment that they want a little more time than is available before the mail closes to-day.

The paper, packing material (wood-wool), &c., are novel to the trade here, as far as oranges are concerned, but the fact that not one orange was blemished, bruised, or marked in any manner shows how successful the packing arrangements were.

At the present time only West Indian oranges are on the market, and both the Valencia and Mediterranean varieties are superior to any oranges on the London market at present. If they reached here earlier, say in July, August, or September, better prices would be probable. To-day the thin skinned variety are worth about 1d. each wholesale, but Messrs. Keeling and Hunt will report on this.

A remarkable feature of the shipment was that every orange arrived as if only just picked from the trees; the bloom was hardly off the fruit, while "silk skin" of the thin-skinned variety makes them specially suited to English tastes. It was in every way a credit to the packer, and they make a fine display in our show-room to-day.

WALTER PREEDY,
19-10-06.

Sir, London, 26 October, 1906.

With further reference to your letter of 4th September respecting the oranges shipped from Pera Bore, I have pleasure in forwarding herewith copies of reports by Messrs. Keeling and Hunt and Messrs. Garcia, Jacobs, & Co., respecting the shipment.

These are respectively very large importers in the Monument and Covent Garden markets.

Mr. Preedy, with whom I entrusted the care and display of these oranges, tells me that in September he noticed the West Indian oranges were fetching a little over 1d. a piece wholesale, while the New South Wales oranges are considerably superior fruit.

Of course, the whole question of shipping oranges from New South Wales, as Messrs. Keeling and Hunt point out, depends upon the cost they can be landed at. The first shipment was in every way a credit to all concerned in it, and if next year any of our growers care to test the market, as suggested by Messrs. Keeling and Hunt, I shall see that my officers give every possible assistance in the matter.

The newspapers gave favourable notices regarding the oranges, one or two copies of which I enclosed. I have, &c.,

T. A. COGHLAN.

Dear Sir, Monument Buildings, Monument Square, London, E.C.

We are in receipt of your favour of the 18th inst., and we have examined the oranges which you sent to us. We have nothing but praise for this fruit, it is of excellent size, beautiful colour, and splendidly clean. We could not expect such large oranges to have what is known as "silk skin" (and it is almost hypercriticism to refer to it), but taking them all round they are as near perfection as possible.

From certain parts of Spain we get this kind of fruit—often with the "silk skin"—then it stands by itself, and realises a fine price in spite of heavy arrivals. But these Spanish oranges come from December to May, whereas we take it that your oranges would come in August and September. We have only to think, then, of two things—

(1) What will there be to compete with them?

(2) What will these oranges cost, *i.e.*, c.f.i.?

We can only answer the first question.

Oranges from the West Indies will be their rivals. This fruit is of fine size and silky skin and it is very sweet, indeed it is almost sickly, but it altogether lacks the truly magnificent colour of your fruit, and we feel sure that the latter would be much preferred by the buyers. These oranges from the West Indies, if sound and bold, make about a penny each, but, of course, if they come unsound, prices are very low. Your fruit should be sent as follows:—

The large oranges in boxes of 80 to 100. The medium oranges in boxes of 120 to 130.

The small oranges in boxes of 150 to 180.

The boxes should all be the same size and should be marked very plainly on one end with the shipper's name and the number of oranges in the box, thus:— V. SMITH 80. | V. SMITH 100. &c.; and if the fruit is of very fine quality, thus:— V. SMITH 100 VERY FINE

The term, "silky skin" simply means extra fine thin skin. We believe that prices would be about 10s. or 12s. per box; they might be more, and probably would be more at the commencement of the season, but a trial shipment would give us a better idea. We would like to put 100 boxes on the market in August and 100 in September. If the public took to the first—and there is no reason why they should not—a thousand boxes a week would be easily disposed of.

We are well aware that during August and September there is a lot of other fruit on the market, but during the other months there is a superabundance of oranges, with the exception of June and July, then we have strawberries, and people having had nothing but oranges and apples from November to June are eager for the change. But we really believe that the colour of your fruit will bring people on to it again as soon as strawberries finish, and we also believe that your oranges will be preferred to Jamaicans.

So far as you are concerned the main point is:—

Will the public prefer the Australians to Jamaicans?

We think the public will, and that is why we advise your people to make a good trial. We like the "Valencia Late" orange best. The Bloods are rather thick skinned and the "Mediterranean" has a tendency in that direction.

Let the growers send direct to us, and let them strenuously oppose the speculator, who will attempt to buy their fruit out there. If he gets into the business it simply means that he is going to pay his attention to quantity and let the quality look after itself. The common fruit which will come will soon make the public prejudiced against Australian oranges. If your oranges get here in sound condition they will hold their own, and the finer the skin the more they will realise.

Yours, &c.,

KEELING AND HUNT.

The Agent-General for New South Wales,
123 and 125, Cannon-street, E.C.

Bank Buildings, Bow-street, Covent Garden, London, E.C.

Dear Sir,

In reply to yours of this date, we have examined the oranges most carefully, and we admit that the quality is all that can be desired. On that score your friends need have no fear but that they would give satisfaction. The Blood orange is one that is not appreciated on account of the skin being so rough. Both the Mediterranean and Valencia Late are exceptionally good and would sell well. The great consideration as regards the success of this business arises from the fact that these oranges would arrive here in the middle of our soft fruit season, say during the months of July, August, and September, when the demand for oranges is of a very limited nature. That a moderate quantity of these oranges would sell at a fair price is only reasonable to expect, but we fear that the cost and incidental expenses would be such as to preclude any large business being done at a profit. What we would suggest would be three trial shipments of 100 cases each to arrive here during the months of July, August, or September, when we shall be better able to test requirements of the trade, which is naturally the public demand. Any further information that you think would be of service we shall be very glad to place at your disposal.

Yours, &c.,

GARCIA, JACOBS, & CO.

T. A. Coghlan, Esq.,
Agent-General for New South Wales,
123, Cannon-street, E.C.

"ARTESIAN" ORANGES.

Advertiser.

THE New South Wales Government have at their premises at 125, Cannon-street, a remarkable display of oranges which are grown with the aid of artesian water on a settlement near Bourke, New South Wales. The exact locality is Pera Bore, where the rainfall is very scanty, but where nature has provided a plentiful supply of artesian water. * * * * A number of these oranges were on view at Covent Garden and the Monument markets yesterday and created a very favourable impression. They travelled 600 miles by rail and some 12,000 miles by sea, and, as will be seen from the fruit exhibited, they arrived in perfect condition, and if large supplies were available, would fetch good prices on the London market. This is the first we have seen of the actual results of artesian irrigation in the dry parts of Australia, and the experiment, which was carried out by Mr. Moore, Minister for Agriculture in New South Wales, is one of considerable interest, and the exhibition is well worth a visit.

Daily Mail.

AFTER travelling 12,600 miles by rail and sea, some oranges which are grown with the aid of artesian water on a settlement near Bourke, New South Wales, have arrived in perfect condition, and are now on view at the New South Wales Government offices, 125, Cannon-street.

Entomological Notes.

W. W. FROGGATT.

A CORRESPONDENT has forwarded a large caterpillar for identification; it is the larva of one of our large yellow Hawk Moths (*Cæquosa triangularis*). This caterpillar feeds upon the acacia and gebung bushes. When full grown it turns into a hard black chrysalis among the rubbish under the bush. The moth is a large handsome mottled-yellow creature.

Specimens of spiders removed from a wasp's nest at Trundle have also been received. These spiders were alive when found, but paralysed. The spiders appear to belong to several well-known groups of web spinners. These spiders have been reduced to a moribund state by the wasp, which injects a certain amount of poison into the spider, which does not kill it, but by paralysing it renders it helpless. The wasp then lays an egg in the cell, and her maggot-like larva attaches itself to the body of the spider and sucks up the internal parts. By this means it has a fresh food supply all the time it is feeding, and by the time the last spider has been devoured, it is ready to pupate and turn into a wasp later.

From Capertee specimens of insects that are destroying apple-trees have been received, with a request how to destroy them. This insect is a small weevil allied to the "Dicky Rice," which eats the skin of the young oranges in a similar manner to the apples. They are very difficult things to kill with any kind of spray. With the allied Dicky Rice, we find the best method to collect and destroy them is to spread a sheet under the tree and then tap or jar each branch with a stick (rolled up in rag so that it will not bruise the bark). Early morning or night is the best time to jar the tree, for then every beetle will fall and can be easily gathered up and destroyed.

CATERPILLARS IN THE MACLEAY RIVER DISTRICT.

IT has recently been reported that caterpillars are very numerous in the crops and grass in the Macleay River district; on one farm they are particularly bad, and it is thought that the corn may suffer next. The best thing to do to check the progress of the cut-worms is to lay poisoned bran over the country they are feeding on. A corn paddock could be protected by a furrow running round it on the side the caterpillars are coming, and fill it with chaff or some such fine material well sprinkled with kerosene. The poisoned bran is made by mixing 1 lb. of Paris green (a deadly poison) with 60 lb. of bran, dry, and when thoroughly blended, made into a mash with salt water; this mixture should be scattered broadcast by hand through the infested crop,

where the caterpillars eat it. It is found that when the poison is spread about four o'clock in the afternoon, just when the caterpillars are moving, for they feed upon it during the night, it is most effective.

These preventives and remedies mean work and expense but are worth taking in hand to save a good crop.

"Bot Fly" in the Inverell District.

Recently a specimen of the introduced "bot fly" (*Gastrophilus equi*) was received from the Inverell district; this fly causes bots in the stomachs of horses.

The fly (female) deposits her eggs upon the hair on shoulders of the horse, the eggs are attached to the hair by means of a gummy secretion. The horse licking itself gets these eggs into its mouth, and when the tiny maggots hatch out of the eggs they are carried down into the stomach and attach themselves to the inner coating of the stomach by means of two hooks in front of the head. These fleshy maggots remain in this state feeding on the gastric juices until they are full grown, when they release their hold and pass out with the dung and pupate in the soil beneath the droppings. From this the perfect fly will emerge a few weeks later in the summer.

There are many internal remedies advocated, but the best of them are very little use once the bots get into the stomach. The best thing to do is to examine the horses every morning and clear away any eggs noticed on the hairs during the bot fly season.

The Large Elephant Beetle attacking Apple Trees.

A specimen of the Large Elephant Beetle, *Orthorrhinus cylindrirostris*, was lately forwarded to me, having been found in the trunk of an apple-tree, where it had cut a small ring almost to the sap. This is a very common weevil that attacks the bark of many trees, but at times are a regular pest to orange-trees, as they deposit their eggs under the bark, the larvæ burrowing into the wood, living and pupating in the stem. They often breed in numbers where soft-wooded trees or dead wood is left about a place, or in dying trees, from which they go into the orchard. The orange-growers, when they appear, go round the trees every now and then and gouge the eggs out of the bark where the cut made by the beetle can be easily noticed; this is a slow but sure way of keeping the grubs out.

Barren Areas in the Coonamble District.

Some months ago, the landholders of the Coonamble district were puzzled at the appearance of barren areas on the black soil, on which no grass or herbage grew, though beyond these often sharply-defined areas the bountiful rains of the last six months had brought forth a rich crop of grass and herbage of all kinds.

Local investigations brought to light the fact that within these grassless patches, where there was any shelter on the ground, it was the hiding-places of swarms of small black beetles, and after heavy rains, these beetles, driven off the ground, swarmed up into the shrubs and posts in countless millions. The man on the land did not worry; many of them put it all down to "rabbits poisoning the country," in spite of the beetles noticed.

Mr. Taylor, C.P. Inspector, became interested in the matter, and, with his well-known energy, sent samples of the insects, and a description of the damage placed to their credit, to the Department of Agriculture.

Last week, after making arrangements with Mr. Taylor, I went up to Coonamble, and, under his guidance, travelled over a large portion of the "black patch country," ranging from Bimble to Tyrone, Bundy, and Woodside.

I found that while there are probably many large bare patches due to other causes, such as rabbits, scalded plains, &c., there are many well defined areas right in the centre of richly grassed land consisting of thousands of acres that are due to some other cause. Where the barren land was examined, under every log, round every stump and post, and hiding in the cracks in the soil, under the "Roley-poley" bushes, were swarms of small black heteromerous beetles (allied to the common meal-worm beetle). In some places, where the logs were buried in the soil, or hollow, I could have taken quarts of living beetles from under every stump.

Though this family of beetles (*Heteromera*) does not contain many very injurious insects, yet the larvæ of some species, popularly known as "wire-worms," are known to damage the roots of plants in Europe; but this is the first record that I have of them doing any serious damage.

These small black beetles deposit their eggs in decaying wood or such like material, from which the slender dark-brown or yellow cylindrical larvæ develop. They are of a uniform thickness, rounded at the head and tip of the abdomen, and when full grown will measure about one-third of an inch in length. It is in the "wire-worm" stage that these pests have done most of the damage, feeding underground on the roots all through the winter; then, when full grown, they changed into pupæ, when they did not feed, but, still underground, gradually changed into the perfect beetles which we now find on the barren land. During the whole of the larval and pupal stage they were probably only a few inches, at the most, beneath the surface; but while the beetles can live in the cracks in the ground, they cannot now live in the solid soil, and eat very much less than the larvæ.

Remedies and Suggestions.—It is probable that these beetles lay their eggs in one common centre, and if this proves to be the case, the bare patches would be soon distinguished when they first began in the black soil, and with very little trouble a plough or scarifier could be run round the infested spots and the wire-worms confined to one spot, or turned up

and destroyed. Burning-off the Roley-poley bushes, where practicable, would also kill off an immense number of beetles and their eggs, and the same would apply to burning-off all logs and cover on the plains. One will probably be told that it is too much trouble to take these precautions, in the same way that no one ever suggests the destruction of the eggs of the grasshoppers (locusts) in the scalded plain country, where millions could be destroyed, either as eggs or just as the delicate little hopper is emerging from the ground. Yet, once let these little creatures develop into winged grasshoppers, and they will eat off the best picking of thousands of acres of land, and cannot be checked.

If these beetles appear next year, I should like to examine some of the country about midwinter.

Reclamation of Wind-swept Soil in the Murrumbidgee District.

"Australian," in the *Forbes Times*, in an article entitled "Along the Murrumbidgee from Hay," has the following paragraph:—"Coming up the river as far as Kooba, one is struck with the tremendous growth of grass, in many places up to the horse's wither, whilst at the back of Groongal, Wyvern, Bringagee, Benerembah, and Kooba, a distance of 30 miles from the river, the grass is like a wheatfield. Places where the wind had swept fully 6 inches of the surface soil away, and where one would think that grass would never grow again, is now covered as thickly as ever. During 1902 and 1903, when the surface soil of many of their properties was being blown away, Mr. McKinney, of Kooba, adopted a method which almost entirely prevented the soil from being transferred to the vicinity of the coast. He cut down a number of young pine-trees, dead and green, and carted them to one of the paddocks, where they were placed along the ground in rows about 20 chains apart. These breaks collected the sand and seed blown from other places west, with the result that long low ridges were formed, which were a protection to the land between them, as well as to other paddocks further east. Now these paddocks are the most heavily grassed on the station, with a variety of grasses not seen in any other part of the locality."

The subject of dealing with the sand-drifts and the reclamation of land on which the surface soil had been blown away was fully discussed by Mr. J. H. Maiden, Government Botanist, in the *Agricultural Gazette* for November, 1906, in which many interesting particulars are given and the various means adopted, both here and in other countries, to cope with both the coastal sand-dune and the western sand-drifts. The above is particularly interesting in this connection, and is additional evidence of the claim put forward by Mr. Maiden that the western sand-drifts can be dealt with if systematically taken in hand.

Viticultural Notes.

M. BLUNNO.

The Allandale Co-operative Distillery.

THE distillery was established about six years ago, with the object of utilising some of the surplus wine then being produced, for which no ready sale would have been found, thus initiating the brandy-making industry in the district. The locality is most suitable, on account of the large yields obtained on the Hunter. The progress made by the wine-growers, however, in the wine-making industry, reduced to almost nil the supply of inferior wines, which for the first year or two fed the distillery, and the management found themselves compelled to buy good, sound wine to keep going, which, naturally, is all the better for the quality of the brandy. For fair wines they pay at the rate of 8d. per gallon, and, considering the large yields of these vineyards, the viticultural industry in this district is very profitable even when selling the wine at that price. A crop yielding 500 gallons of wine is not uncommon; the expenses of picking, pruning, cultivating, &c., and interest on capital can be put down at £5 per acre, which is a liberal estimate. This would leave a net profit of from £11 to £12 per acre. A very satisfactory return. Some vineyards on the river flats give even larger yields; and I know of one, the average yield from which is at the rate of 700 gallons per acre, and all very good wine, which is aged for from three to four years, and then bottled. It is a wine which has had a reputation for many years, and still keeps the same good name.

The distilling apparatus is composed of a battery of eight stills of the Besnard system and French make; each still is continuous and automatic, but they are all connected. There are about 20,000 gallons of wine spirit of different ages stored at the distillery, and a similar quantity, I was informed, stored in Sydney in bond.

The strength is about 75 per cent. by Gay-Lussac, which is equivalent to 30·70 per cent. over-proof. Naturally, water is added afterwards to break it down to the normal strength of brandy, which is 42 per cent. Gay-Lussac. This brandy is already on the market, and has been favourably received in London.

The War Office had samples brought under its notice, and the company was informed that if they intended to tender for the supply of brandy to the English Army, they should have a depôt in London, so that if their tender should at any time be successful, the bulk contracted for might be delivered without delay.

The total quantity of spirit distilled, viz., 40,000 gallons of 75 per cent. Gay-Lussac strength, means that nearly 300,000 gallons of wine have been distilled. So much wine being distilled greatly contributed to relieve the glut caused by the increased acreage under vines and various good seasons.

The distillery has been a great help to small growers who wished to dispose of their vintage for cash, without the delay of finding purchasers of wine for consumption.

There is no doubt that the establishment of the Allandale Co-operative Distillery has been of great benefit to the district, and has helped in no small degree to make the industry more stable, by providing a means of disposing of a very large quantity of wine.

Sulphuring Vines for Oidium.

The best time of the day to dust the foliage and grapes with sulphur is during the cooler hours of the day. Sulphur should not be applied while the foliage is wet with dew or rain. The same precautions should be taken when applying sulphur, whether the berries are small or are turning colour. A cool, possibly a cloudy, day is the best for dusting sulphur, which can also be applied while the vines are flowering. Sulphur acts as a sort of stimulant to the flowers, which, as experience has shown, set better. The sulphur will have had its effect in a week; but after rain, vines are subject to a fresh outbreak of oidium, therefore a supplementary application of the remedy is necessary.

Black Spot (*Anthracnose*).

Repeated spraying with Bordeaux mixture will, to a certain extent, check the spread of this disease, if precautionary measures have not been taken in the winter. The more reliable method of combating this disease is by applying a winter dressing, which will prevent an outbreak altogether. The dressing consists of a solution of sulphuric acid, prepared by mixing three-quarters of a pint of strong commercial sulphuric acid in a gallon of water. Care must be exercised in making the solution. Add the acid slowly to the water; on no account add the water to the acid, for it is extremely dangerous, as the mixture may spurt up and damage the face and hands. By adding the acid slowly to the water there is no danger. Do not use a metal vessel; earthenware or wood only should be used, as the acid will quickly corrode metal. Vines are first pruned and then treated with the solution; the stem, branches, canes, and buds are daubed with a brush or mop. The time for applying the dressing is just about ten days before the buds open into leaves.

If black spot has been very bad during the previous season, two dressings will be more effective in preventing the outbreak. The first dressing would have to be applied one month before the buds break, and the second, ten days before, as above stated. In spring and summer,

in any case, all the foliage should be protected by repeated sprayings with Bordeaux mixture (summer strength). The prunings should be carefully collected and burnt before the dressing is applied.

The solution of sulphuric acid once dried on the stem and branches is not easily washed away by rain. The acid penetrates into the tissues, and it is because it does so that the remedy is so effective.

The owner of a large vineyard will find the application of the winter dressing by hand with a mop or brush slow, tedious, and expensive, apart from the uncomfortable smarting of the hands, which even the most careful man cannot keep dry.

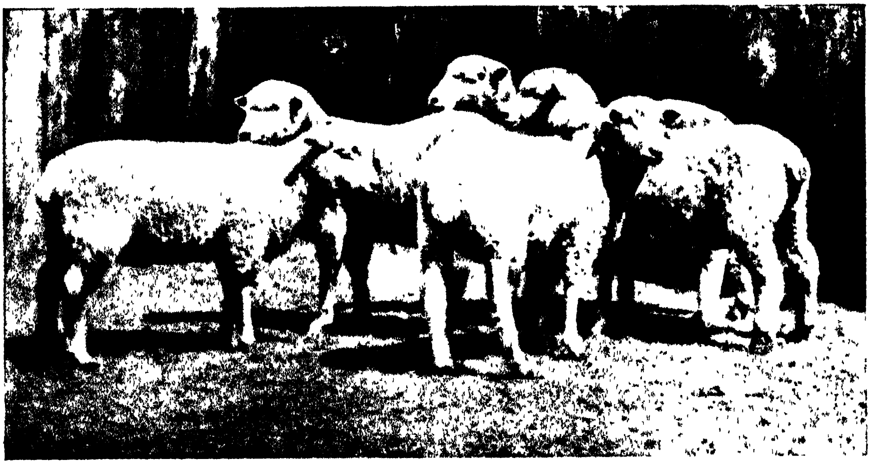
Special knapsack spray pumps are constructed by Mons. V. Vermorel, of Villefranche Rhône (France), in which lead is substituted for copper. Lead is not corroded by sulphuric acid like copper, and one of these pumps will last a long time if properly cared for. The cost of one, delivered in Sydney, is about £2 10s.

Wagga Experimental Farm.

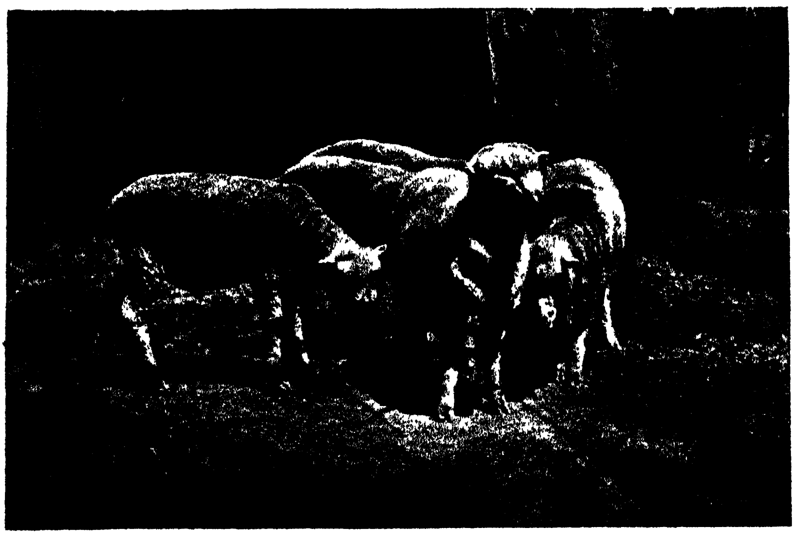
G. M. McKEOWN.

CROSS-BRED LAMBS.

THE interest that is being taken in the production of fat lambs for export by pastoralists and farmers is being manifested in many directions. The



Second Cross Lambs—Shropshire on Lincoln x Merino.



Shropshire x Merino Lambs.

introduction into this State of rams of British breeds is increasing each year. It is, however, a matter that careful trial alone will show which breeds are the best to breed from with merino ewes and first crosses. As long as the wool industry in Australia lasts there will always be

Lincoln x Merino Lambs.

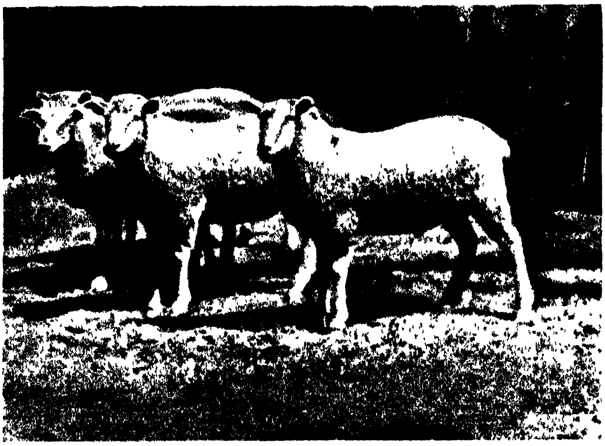
a plentiful number of merino ewes, the carcasses of which will be a secondary consideration; wool being the object for which the sheep are bred. To build up a fat-lamb trade from such dams will only be possible by the intermingling of blood of the larger-framed, early-maturing

Border-Leicester x Merino Lambs.

British breeds. At the Wagga Experimental Farm experiments have been carried on now for six years, and the result of the crosses have been made public as they became available. The returns for 1906 are now complete,

and will afford some useful data on which to base trials on a larger scale. The lambs were marketed at from 17 to 21 weeks' old during the months of October and November. To obtain lambs of this age fit to market then, it was necessary to get an early lambing, and for this purpose the rams were put with the ewes in November and December.

The table which follows gives full details. Five breeds were experimented with; two lots of Lincoln-Merino cross-bred ewes were put with Shropshire and Border-Leicester rams, and three lots of Merino ewes with Shropshire, Lincoln, and Border-Leicester rams respectively.



Second Cross Lambs—Border-Leicester on Lincoln x Merino.

LAMBS 1906.

Breed. Twelve of each weighed.	Age—weeks	Per cent. of lambs.	Average weight.	Average growth.	Per cent of ewes
			lb	per day lb.	Assisted at lambing.
Shropshire x Lincoln x Merino ..	20	93	104·83	·741	4·45
Shropshire x Merino ..	21	75·28	86·25	·587	19·10
Lincoln x Merino	20	82	90·08	·643	28·57
Border-Leicester x Merino... ...	17	83·67	89·58	·752	26·53
Border-Leicester x Lincoln x Merino	16	93·87	92·66	·827	2 04

The above table demonstrates the value of the respective ewes as mothers; from various points of view the Lincoln x Merino cross-bred making the best record. It also shows the risk at lambing-time attending the breeds represented, and the desirability of exercising proper supervision over lambing ewes.

A consignment of shorn lambs from the farm, sold at Flemington in the middle of November, averaged for Shropshire x Lincoln and Merino 15s. 9d., and Shropshire x Merino 14s. 9d., leaving a net return of 14s. and 13s. 1d. respectively on the farm. The wool of the lambs is expected to add 2s. 6d. per head to the net return above quoted.

Manure Test on Lucerne.

An experiment with various manures on lucerne has been carried out at Wagga Experimental Farm during the last year. The plots were sown in 1905, but, owing to slight growth, it has not been possible to cut it before.

The following table shows the result of the test carried out on eight ½-acre lots, two of which received no manure, but one was limed, while the other was not. These were retained as check plots. With the exception of the plot manured with sulphate of potash only, the effect of manuring and liming was to increase the yield. From the table it will be seen that superphosphate on limed land gave the best result, and the addition of a half-cwt. sulphate of potash to the superphosphate did not benefit the yield, while, when applied alone, the result was less satisfactory:—

Each Block ½ acre, 8 chains long.

Block No.	Land	Treatment per acre.	Yield per acre. cwt.	qr.	lb.
1	Limed land	No manure	50	2	0
2	Do . .	2 cwt. Super.	63	0	0
3	Do . ..	2 cwt. Super. and ½ cwt. Sulph.-potash .	62	2	0
4	Do	Do do do .	25	2	0
5	Unlimed land	No manure	36	0	24
6	Do	2 cwt. Super.	43	3	4
7	Do	2 cwt. Super. and ½ cwt. Sulph.-potash ...	41	0	0
8	Do . .	Do do do . .	37	0	0

The land is a red loam, with granite sand overlying, and it is very tenacious and difficult to work . The crop was cut and allowed to lie; but as the heat was insufficient to dry it, it was carted in, in a green condition, and weighed. This fact, however, does not affect comparisons.

Wheat.

Experiments have been carried out from year to year at this farm since 1899, and complete records have been kept; they are here presented in tabulated form for comparative purposes; showing the rainfall for the year, and also the rainfall for the period covered from before sowing to the time after which the crop will derive no benefit from the rainfall.

No less than twenty-six varieties have been tested. In 1899 six varieties only were tested; but each year, up to 1903, the number has been added to, many being wheats of the late Mr. W. Farrer's origination. Most of the wheats tested for yield under crop at this farm are fully described and illustrated by Mr. F. B. Guthrie in the *Gazette* for December, 1906.

The methods adopted have been described on various occasions in the *Gazette*; and for a full and detailed account of the system pursued, the *Gazette* for May, 1905, should be referred to.

YIELDS from Manured Crops.

Variety.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	Average.
Rainfall for year	15·90	24·60	17·93	11·97	19·41	16·15	19·15	..
,, 1st Feb. to 30th Nov. ..	10·87	21·93	17·33	7·57	18·36	13·18	...	...
,, 1st May to 15th Nov. .	10·12	14·11	13·58	6·54	10·51	11·39	.	.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Hudson's Purple Straw .. .	18 49	24 10	24 30	6 26	34 6	16 30	...	20 45
Farmers' Friend	19 24	24 46	27 54	6 31	28 29	20 7	22 2	21 22
Zealand or Berthoud ...	14 53	26 4	15 28	3 24	22 11	20 11	21 1	17 36
Australian Talavera (old)	12 19	26 2	17 58	2 25	26 58	...	...	17 8
,, ,, (new) .	...	..	16 46	4 57	28 48	20 57	17 50	17 51
Steinwedel .. .	15 18	24 7	18 30	6 15	34 30	..	...	17 47
Marshall's No. 3 . .	15 15	28 16	.		...	14 9	20 31	19 33
Dart's Imperial .		20 25	18 45	4 51	24 55	20 26	25 0	19 4
Jade	.	30 6	18 46	5 32	30 52	20 24	20 57	21 6
Lambrigg White Lammas		27 49	15 32	4 38	23 37	18 30	17 46	17 58
Steinlee		25 28	14 23	6 6	35 27	...	...	.
Nonpareil .. .		27 56	18 9	4 55	33 44	...		..
Jonathan		..	18 51	3 40	26 51	16 28	17 31	16 40
Cumberland . .	.	..	19 25	5 43	28 30	18 27	25 0	19 25
White Essex .	.	..	19 30	6 24	32 16	20 20	20 7	19 43
White Tuscan .	.	..	.	5 57	29 10	17 30		17 32
Schneider . .		..		7 25	32 13	17 4	13 7	17 27
Sussex	.		.	6 17	25 18	17 43	..	17 18
Field Marshal ..	...	...	.	6 11	28 14	17 30	20 0	17 59
Bobs		.	..	5 30	29 23	18 11	21 4	18 17
Federation .	.	.	.	6 20	38 11	22 15	21 51	21 39
Tardent's Blue	.	...	13 53	4 2	27 38	17 57	...	15 52
John Brown .	.	.	...	..	32 27	17 58	22 56	24 27
Plover .	.	...	...	..	31 21	17 2	22 18	23 33
Algerian ...		17 35	8 8	3 12	24 58	.		13 28
Poland		..	7 40	1 19	14 21	..	.	7 46

YIELDS from Varying Quantities of Seed.

	1899.	1900.	1901.	1902.	1903.	1904.	1905.	Average.
Farmers' Friend—	7 17	21 8	..	..	24 14	18 31	.	17 47
20 lb. per acre. ..	...	...	.	...	..	...	.	...
40 lb. ,, .	14 7	24 54	...	.	24 38	20 0	.	20 54
60 lb. ,, .	14 52	27 54			23 15	19 12		21 18

YIELDS from Varying Quantities of Manure.

	Cost per acre s. d.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	Average.
None	Nil.		8 57	16 34	...	16 49	16 45	9 36	13 44
25 lb. Bone-phosphate ..	1 2	..	11 56	17 52	...	15 12	...	...	15 0
35 lb. ,, ...	1 9	.	13 26	23 4	..	21 25	18 30	...	19 6
60 lb. ,, ...	3 0	.	14 0	23 59	...	24 3	18 1	...	20 1
60 lb. ,, .	3 0	...	...	...	...	26 26	19 12	...	...
60 lb. Superphosphate .	2 9	...	...	..	...	28 29	20 7	21 4	24 18
None	Nil.	.	...	..	..	13 15	16 45	...	15 0

From Drilled Seed against Broadcast (same quantities Seed and Manure).

	1899.	1900.	1901.	1902.	1903.	1904.	1905.	Average.
Drilled	..	13 27	25 26	...	23 15	19 12	...	20 20
Broadcast	.	11 29	22 23	...	21 26	16 31	...	17 57

WHEAT YIELDS.

Year.	No. of Paddock.	Area.	No. of Blocks.	Yield	Varying from.	Average	Remarks.
		acres.		bushels	bus lb. bus. lb	bus lb.	
1899	5	90	...	1,330	12 0 to 19 0	14 48	
1900	4	86	10	1,762	16 30 ,, 30 0	20 29	
......	3	45	10	1,120	....	25 22	
...	1	45	12	507	9 0 to 14 0	11 16	Late sown.
1901	2	155	22	2,654	7 40 ,, 24 30	17 46	
..	1	45	10	989	16 30 ,, 27 50	22 0	1 variety.
1902	5	212	29	875	Nil ,, 7 25	4 7	
1903	4	92	11	2,258	21 30 ,, 33 40	24 32	
.. ...	2	155	19	3,128	13 15 ,, 35 30	20 8	
..	1	45	10	930	15 15 ,, 28 30	20 40	1 variety.
1904	5	237	38	4,316	10 9 ,, 22 15	18 30	14 methods.
1905	2	155	22	3,228	13 7 ,, 28 0	20 49	

Average, 16 bus. 57 lb.

BARLEY.

THE following table, giving the yields from the fourteen varieties of barley on trial at the farm, is more than of passing interest.

Barley seems to be a crop many farmers fight shy of. No doubt it takes more careful farming, and the risk of having the value of the grain seriously reduced by bad weather at harvest time is not to be overlooked. Still, considering the very satisfactory yields consistently obtained at this farm, omitting, of course, the drought year of 1902 when the crop was almost a failure, and the fact that even if the grain has not the plumpness demanded by the maltster, it always commands a good price as stock food.

Last season's Manure tests resulted as follows:—

	Bus. lb	
No Manure	31 37	per acre.
½-cwt Superphosphate per acre	36 24	,,
½-cwt, Superphosphate, and ¼-cwt. Sulphate of Potash, per acre	40 37	,,

BARLEY YIELDS.

Variety.	1901.	1902	1903	1904	1905.
	bus lb.	bus lb	bus lb	bus lb	bus. lb.
Golden Grain ..	39 32	5 35	32 46	26 49	36 10
Kinver ...	36 44	9 26	34 14	30 27	36 20
Hallett's	32 48	3 41	32 27	31 14	40 34
Cape	.	6 23	...	.	..
Skinless		7 17	13 16	19 3	29 8
Albert ..	.	..	...	17 17	..
Eclipse ...			..	24 14	27 8
Invincible	..	.		24 5	43 5
Standwell	..	.		28 2	29 24
Brewers' Favourite	.	.	..	20 28	23 13
Maltster	.	..	...	19 40	21 36
Zero	..	..	..	22 9	..
Averages ...	33 15	6 25	31 20	23 17	29 25

General Average, 25·20; Average, three best varieties, 27·12.

WHEATEN HAY.

A CONSIDERABLE amount of wheat is grown each year for hay, and forms an important part of the farming operations.

The crop is cut with a reaper and binder when the wheat is in the flowering stage, and immediately properly stooked, with not more than seventeen sheaves in a stook, so as to admit of the free passage of air. By not making the stooks too large, it is possible to obtain hay of good colour, which is an important factor governing the price the produce will bring in the metropolitan market. Stacking should not be delayed, but the sheaves should be stacked as soon as dry enough, and not left to bleach and deteriorate in the wind and sun. A good size for a stack

Hay Stacks, Wagga Experimental Farm.

is one to contain about 50 tons. For this, the base should be 27 feet x 15 feet, widening gradually until it reaches 18 feet at the eaves, and then drawn in to form the pitch. It may then be thatched or covered with one of the many roof-coverings now on the market, or the stacks may be topped as described in *Gazette* of November, 1905.

The following table shows the yields obtained since 1900:—

Year.	Area—acres.	No. of Blocks.	Yield-tons
1900	155	6	523
1901	176	3	417
1902	200	5	36
1903	205	7	609 (and ensilage, 100 tons.)
1904	200	3	227
1905	173	2	518
1906	92	1	287

Average yield per acre for 7 years: 2 tons 3 cwt. 2 qrs. 9 lb.

Bathurst Experimental Farm.

A Special Visit Arranged.

In view of the prospects of a good crop of apples at the Bathurst orchard, the Honorable the Minister for Mines and Agriculture (Mr. S. W. Moore) has arranged that facilities shall be offered to fruit-growers and farmers to visit the farm in the middle of February, in order that they may see the different varieties growing, and the crop of fruit on the trees. This will afford to all those who anticipate planting apple-trees, or think of reworking any unprofitable variety to a better kind, an opportunity to decide for themselves which varieties they favour. The Fruit Expert, Mr. W. J. Allen, will be specially in attendance, and the orchard staff will also be available for general information in regard to fruit matters, and the conduct of the orchard work.

Arrangements have been made with the Railway Commissioners for the issue of tickets at single fare for the double journey, from all stations not less than 25 miles from Bathurst, on presentation of the necessary certificate, which can be obtained on application to the Director of Agriculture. The day appointed is Thursday, 14th February, and the visitors should reach Bathurst on the morning of that date.

The apples from the Bathurst Experimental Farm have gained a wide reputation, which is not confined to the Australian States, and the opportunity offered should be availed of by fruit-growers desirous of adding to their knowledge of this class of cultivation, and of growing fruit equal to what can be seen there.

This year's fruit crop at Bathurst Farm easily constitutes a record. The apple-trees themselves promise to yield no fewer than 10,000 bushel cases. The crop of prunes is exceptionally heavy, and a yield of 3 to 4 tons is expected. Pears are expected to give a return of something like 750 to 1,000 bushels. In fact, the whole of the trees throughout the orchard are loaded, and all are in healthy condition, the peaches being of exceptionally fine character. Thanks to the efforts of the orchardist, Mr. E. K. Wolstenholme, and his assistants, the orchard is almost completely free from codling moth, the pest being found in but a few isolated instances.

Hawkesbury Agricultural College and Experimental Farm.

To Raise Seedling Potatoes.

C. T. MUSSON.

A SUPPLY of seed from the potato fruit—that is, from the true fruit, or, as it is called, the "potato apple"—should be obtained from any Sydney seedsman, or from Sutton and Son, Reading, England. It would be well if locally-saved seed could be obtained; but it must be from good varieties, such as Early Rose and Brownell Beauty. Plant the seed in a bed properly prepared, in good soil well cultivated. Do not manure or water too much. The product in actual tubers will be but small, and there will not be many. These tubers must be sorted over and only the largest used; they should be dark or red-skinned forms.

These first-saved tubers are now planted in a different place, under conditions likely to give good results. Again the tubers produced are selected (for size, shape, colour of skin), and only the best planted.

These second generation tubers are now planted in another place in fresh ground, under suitable conditions, and the result should give marketable tubers, which, if suitable, can be sown for a bulk crop.

At this stage, the third generation—which can be arrived at in two years, planting for each potato season—the matter of selection to produce a fresh variety has shown what results are likely to be.

It is necessary to be very careful as to going on with the matter; an ideal should be aimed at, and only a sound, good, shapely tuber, of the right colour and proper cooking quality, should be proceeded with, otherwise it is better to start again. The probability is, that it might be years before a really good result is obtained. Therefore, it would be well to start with a fresh batch of seed once a year, and go in for it thoroughly.

Potato Flowers.

The flowers of potato plants often do not set, and probably it is the general rule here for this plant not to produce fruit ("apples").

This is constitutional, and cannot be avoided; nor can the formation of flowers by the plant be assisted. It remains for the grower to keep his eyes open, and wherever potatoes of good repute do bear flowers and fruit to save the seed, if any is formed. When flowers do form, the operator can try hybridising, or rather crossing: the two parents would doubtless belong to the same species, and any product therefrom would be a cross. The process is shortly described below.

There is just a possibility that the formation of flowers is more likely to take place on poor soil than on good soil. The latter will conduce to body growth and tuber formation: this encouragement along one line, growth, as in fruit-trees, is often detrimental to production of flowers

and fruit. It is known that where in cultivated plants we grow for seeds, seed-production is increased, and where we grow for body it is reduced, or may even be done away with. In a garden at the College at the present time (very dry season), kept watered, some potato plants—variety Early Rose—are flowering; on better soil the main crop does not show a flower. Here is an opening for some experiments. It might be worth while trying a few plants in some poor sandy soil, keeping them watered and encouraging them to grow without endeavouring to get much growth out of them. Where two seasons are available, that is, in certain districts like our own, both might be tried: it is just possible that the summer crop might be the better one for flowering than the earlier one, which gives here the main crop of tubers. Further, if the tubers could be removed without disturbing the plant seriously, it might throw it into flowering.

To Cross a Potato Flower.

Select the parents carefully; plants of the same variety could be used—indeed, should be, in order to make sure of seed; but trials should be made freely with different varieties of standard quality, proceeding as follows:—The flowers having been selected that are to act as the two parents, carefully cut away the flowers not wanted, two or three only being left on any one stem. When the flower to act as the fruit-producer is in early bud, carefully open up the white petals and cut away the pollen-bearing organs, the stamens; the petals may also be removed, leaving the central part, the pistil, intact. Tie a light-muslin bag over the flowers to prevent access of insects or pollen grains. When the pistil has grown to the usual size and is ready for reception of the pollen grains, remove a stamen by means of a pair of forceps, or in some other way, from the selected male parent and place it on the receptive surface, the top, of the selected female parent. Then again cover up the flower operated on with a light-muslin bag, tied round the stem below, to keep off insects and prevent the wind bringing pollen grains to it, as before.

In a week, all danger of interference by insects, &c., is over, and the muslin bag may be removed.

Give the plants every attention, in order to keep them free from insect pests. Seeing that some trouble has been expended, it would be worth while covering each plant operated on with a mosquito-netting tent, otherwise the labour may be thrown away.

Protect from late or early frost also, if necessary. It would be advisable for anyone commencing this line of work to study the construction of the potato flower, in order to clearly understand the parts and be in a better position to carry out the process. In cases where two varieties are used, it would be well to use each as both parents. For example: suppose varieties A and B are selected, try the effect of pollen from A on the pistil of B, and also pollen from B upon pistil of A. It may be found that one is more active than the other, and one may give more satisfactory results than the other.

Ensilage Notes.

MAIZE FOR ENSILAGE: WHEN TO CUT.

THE following table gives the quantity of water and dry matter in maize at different stages of growth, as determined by the New York (Geneva) Agricultural Experiment Station:—

WATER and Dry Matter in Maize at different periods after tasselling.

Stage of Growth	Corn, per acre.	Water, per acre.	Dry Matter, per acre.
	tons.	tons.	tons.
Fully tasselled	9·0	8·2	·8
Fully silked	12·9	11·3	1·5
Kernels watery to full milk	16·3	14·0	2·3
Kernels glazing	16·1	12·5	3·6
Ripe	14·2	10·2	4·0

This table is very interesting. The last column shows the dry matter of maize at different stages of growth. Ripe maize yields five times as much dry matter per acre as maize that is fully tasselled, two and two-thirds times as much as maize fully silked, and nearly one and three-fourths times as much as maize in the milk; hence, the importance of growing maize for ensilage that will mature. The table also shows the great waste in feeding maize green instead of letting it mature properly and making it into ensilage.

In order that ensilage may keep well, maize should be cut about the time the kernels are well glazed and dented. If it is cut too green, as stated, too much acid develops; if cut too ripe, it does not settle properly, and the air is not sufficiently excluded to prevent spoiling. The ripest maize should always be cut first and placed in the bottom of the silo, because the greater pressure near the bottom will tend to exclude the air. —BYRON HUNTER, Bulletin No. 94, U.S. Department of Agriculture.

SORGHUM SILAGE.

There is still some difference of opinion as to the value of sorghum for silage. The silage ferments more than maize silage, owing to the saccharine juice, and hence does not always keep well. There is no question as to its value when well preserved. Sorghum is a better yielder than maize on poor soils, and a surer crop in semi-arid regions. In the great maize belt (United States) its use is slowly increasing, while along the

Gulf Coast, where the heavy rainfall makes it difficult to cure fodders, sorghum is a profitable silage crop, and can be most successfully handled in this way.

In feeding value sorghum silage appears to be slightly inferior to maize silage, the protein content being rather lower and the fibre content rather higher. However, the amount of water to the ton is also lower, so that the total amount of nutrient in each ton is larger than in maize silage.

The feeding value of both maize and sorghum silage can be increased by adding some leguminous crop. The two crops may be sown separately and mixed while being cut into the silo, or grown and harvested together. The cowpea is probably the best crop for this purpose. Such varieties as Black, Blackeye Clay, Red Ripper, and Whip-poor-Will are commonly used. Soy beans may also be used. Numerous cases have been reported, however, where Soy beans alone, or a large proportion of Soy beans in maize or sorghum silage, have produced a silage which imparted bad odours to milk and other dairy products. Experiments show that no bad effects result from using a small proportion of Soy beans—one part of Soy beans to five or six parts other silage being regarded as safe.

Sorghum silage has been largely used as a winter ration and as a supplementary summer ration for dairy herds, with highly satisfactory and profitable results.—CARLETON R. BALL, U.S. Farmers' Bulletin, No. 246.

Perpetuation of "Potato Disease" and Potato "Leaf-Curl" by means of Hybernating Mycelium.

GEORGE MASSEE,
Royal Botanic Gardens, Kew.—"Bulletin of Miscellaneous Information."

THE sudden and simultaneous appearance of "Potato Disease," caused by *Phytophthora infestans* (De Bary), over widely extended areas in Britain and other countries has hitherto been attributed to the rapid production and diffusion of spores during a period when special meteorological conditions favoured the rapid development of the fungus.

This explanation, however, when carefully considered, proves to be altogether inadequate. When a potato plant infected with the spores of *Phytophthora* is placed under a bell-jar in a very damp atmosphere, subdued light, and high temperature—conditions most favourable to the development of the parasite—it is only after a period of four or five days that the fungus produces fruit on the leaves, and then only at the points of infection. On the other hand, the fact is too well known that a field of potatoes, or all the potato fields in a certain district which at a given moment appeared perfectly healthy and vigorous, have, under certain climatic conditions, been reduced to a blackened, decaying, fœtid condition within twenty-four hours. Again, in the case of every fungus epidemic proved to be due to the diffusion of spores, the disease always originates from one or more primary centres of infection, and gradually extends, whereas in the case of potato disease the appearance of the epidemic is often simultaneous over a considerable area.

These considerations suggested the existence of some method other than dissemination by means of spores as the cause of such sudden outbreaks of disease. The presence of mycelium can readily be demonstrated in the tissues of diseased potato tubers, and a series of experiments conducted at Kew have conclusively proved that such hybernating mycelium in a tuber is capable, under favourable conditions, of perpetuating the disease.

Three diseased potato tubers showing rusty stains characteristic of the presence of *Phytophthora* mycelium in the flesh were each cut into two equal parts. Each half tuber was planted separately in a plant pot; the same kind of soil and manure, sterilised by steam, was used in all the experiments. Three of the pots were placed in a house having a temperature ranging between 70° and 80° Fahr., in dull light, and with the moisture often at saturation point. Each pot was placed under a bell-jar. The three remaining pots were placed in a well-lighted house, without any artificial heat, and with an exceptionally dry atmosphere. These pots

were not placed under bell-jars. An equal amount of water was supplied to each of the six pots. The three plants grown under conditions of high temperature, dull light, and much moisture in the air, showed the first indication of *Phytophthora* when the shoots were six weeks old, and a fortnight later the three plants were blackened and destroyed by the fungus.

The three plants grown in the cool, well-lighted, dry house showed no trace of disease at the end of two months, when one of the plants was removed to the warm-house and placed under a bell-jar. Within nine days this plant was blackened and killed by the fungus. A fortnight later a second plant was removed from the cool to the warm house and placed under a bell-jar. Within a week of the removal of this plant it was also covered with *Phytophthora*. The third plant continued growing in the cool-house for thirteen weeks, and remained perfectly free from *obvious* disease.

Similarly marked results were obtained by using potato tubers produced by a plant that was badly infested with potato "leaf-curl" (*Macrosporium solani*, Cooke), proving that this disease can also be perpetuated by hybernating mycelium present in the tubers.

The above experiments, in addition to proving that the diseases indicated can be transmitted from one generation to another by means of mycelium present in the tubers, also demonstrate another point of much practical importance, namely, that the absence of obvious disease in a crop does not necessarily prove the absence of such disease in a *latent* form.

In the experiments described above, it was known at the commencement that the six half-tubers were all diseased. The three plants grown in the hot, damp, badly-lighted house were promptly destroyed, simply because the conditions indicated were detrimental to the growth of the potato, but highly favourable to the rapid development of the fungus, which soon became dominant and destroyed its host-plant. On the other hand, the three potato plants in the cool-house grew normally under the low temperature, less atmospheric moisture, and better light, a set of conditions very detrimental to fungus growth; hence, although the parasite was present, it remained entirely in abeyance, and the practical man would, without hesitation, have pronounced the plants free from disease.

Every potato-grower of experience can predict almost with certainty the moment when potato disease will appear. The necessary conditions are warm, damp, dull weather; but instead of the sudden outbreak being due to the rapid diffusion of spores, as has hitherto been believed, it is far more probable that in the majority of instances it is due to the existence of mycelium, already present in the tissues, which had hitherto been prevented from manifesting itself in an aggressive form owing to the absence of favourable climatic conditions.

Report from the Commercial Agent.

An official Gazette Extraordinary was published by authority of the High Commissioner for South Africa, at Johannesburg, on Saturday, 29th September, 1906, whereby it was notified for general information that under Article IV of the South African Customs Union Convention, the rebates of customs duties granted on goods and articles, the growth, produce, or manufacture of the United Kingdom have, from the 1st October, 1906, been extended to goods and articles the growth, produce, or manufacture of the Commonwealth of Australia, the Government of the said Commonwealth having extended to goods and articles the growth, produce, or manufacture of the South African Customs Union reciprocal privileges at the following rates:—

Article.	Rebate to be granted.
Tobacco, per lb.	9d.
Spirits	The difference between the Customs and the Excise duties, plus 2½ per cent., equivalent to from 8d. to 3s. 9d. per gallon.
Sugar	(*a*) From cane grown by white labour, £2 per ton. (*b*) From cane grown by black labour, £1 per ton.
Wine, in bottle	Per gallon, 5s.
Wine, in wood	Per gallon, 4s.
Maize	Per 100 lb., 6d.
Fruit, green	Whole duty.
Fruit, dried	50 per cent. of duty.
Fish, dried	Per lb., ¼d.
Feathers	5 per cent. *ad valorem*
Butter Cheese Confectionery Bran, oats, and wheat Flour Hay and fodder Jams Leather Agricultural and mining machinery Meats, including poultry Milk, condensed or concentrated Timber	Not less than 25 per cent. of any duty that may be leviable.

Mr. Valder has forwarded to the Minister for Agriculture printed copies of the Customs Union Convention and Customs Union Regulations, &c., and the following is the form of certificate prescribed to obtain a rebate of customs duties on goods and articles, the growth, produce, or manufacture of the United Kingdom, or reciprocating British Colonies, Protectorates, or Possessions:—

I,(*) the manufacturer [supplier] of the articles included in this invoice, have the means of knowing, and do hereby certify, that the said invoice from myself and amounting to is true and correct; and that all the articles included in the said invoice are *bonâ-fide* the growth, produce, or manufacture of , and that a substantial portion of the labour of that country has entered into the production of every manufactured article included in the said invoice to the extent in each article of not less than one-fourth of the value of every such article in its present condition ready for export to the Cape Colony.

Signature

Dated this day of 190 .

When this certificate is signed by some person on behalf of a manufacturer or supplier, such person must state that he is duly authorised so to do.

Attention is drawn to the marking of tinned and other goods, as to reputed weights, as follows:—

In connection with Customs' Notices No. 1,073 of the 25th of August last, stating that duty would be levied on milk and other articles of reputed weight at such reputed weight, unless the actual nett weight is stamped in the tin and conspicuously and indelibly printed on the label; it is hereby notified for general information that the parties to the Union have agreed that until the 1st of January next, the stamping of the nett weight in the tin will not be insisted upon, but there must be a statement on the label showing the actual nett weight of the contents in a conspicuous and clear manner, and placed on that part of the label which is usually presented to the public.

After the 1st of January both the stamping of the tin and marking of the label will be insisted upon.

A. H. WILSHIRE,
Controller of Customs.

Custom House, Cape Town,
3rd October, 1906.

Weather Conditions during December, 1906.

H. A. HUNT,
Acting Meteorologist.

MONSOONAL influence with high temperatures resulting in thunderstorms and scattered rainfall in various parts of the State ruled till the 3rd. On the latter date, Nambucca recorded 110 and Woolgoolga 102 points. Cooler and more pleasant weather during the passage of an anti-cyclone next obtained over the State till the 6th, when a heat wave again set in over western and northern districts. On this date Mogil Mogil registered a temperature of 108 degrees, and on the following day Mount Hope reached 109 degrees. Heat now steadily accumulated over the State, relieved in places by scattered thunderstorms towards evening. On the 10th, a tornado, about 200 yards in width, passed over Black Range (vicinity of Murrumburrah), uprooting trees and carrying everything in its track. During the evening of this day a southerly change, under high-pressure control, spread rapidly over southern districts to coastal parts causing boisterous conditions generally for twenty-four hours. Cooler and more pleasant weather now supervened till the 13th, when a general warming up under monsoonal influence again set in over Central Australia and rapidly expanded eastwards. On the 14th, Mount Hope registered 113 degrees, while many other stations recorded 100 or over that value. Hot, unsettled, and thundery weather ruled till the 18th, when another cool, southerly change set in over southern districts causing an agreeable drop in temperatures over the whole of the State, which lasted till the 21st. During this period scattered rainfall resulted chiefly over eastern districts. Warm, humid, and unsettled conditions—broken by occasional thunderstorms or showers in various parts—next ruled till the 26th, when a temporary relief was afforded by the passage of another southerly change which passed over southern districts; but an appreciable rise in temperature again set in on the following day over western districts, holding sway there till the end of the month, while more or less unsettled weather, with some heavy showers, ruled in coast parts and highlands.

Taking the month as a whole, the distribution of rainfall has been erratic, due to the fact that the falls were generally associated with thunder. Great disparities in registrations are shown at neighbouring stations; for example: Yass received a total 95 per cent. above the average, while Gunning, at a distance of only 19 miles therefrom, received 30 per cent. below average. Again, Queanbeyan received 4 per cent. above average, while Michelago, 24 miles to the south, had no rainfall. Speaking generally, falls were below average, and in some cases very much below. Out on the Warrego and at Michelago no rain fell, while at many stations registrations approached or exceeded 90 per cent. below normal. On the other hand, records were above normal over

Riverina, Central Western slopes, Southern highlands, North Coast parts, at isolated places over Northern Tableland, and also in the vicinity of White Cliffs and Byrock.

Comparison with India.

A cablegram just received from India shows briefly the conditions over that country for the month just ended. These elements, together with those for our own State, placed alongside for comparison, appear in the following statement :—

	Departure from normal.		General Conditions (referring to the State as a whole).
	Pressure.	Temperature.	
India...	- ·02	+ 1·4	Wet.
Sydney (New South Wales) ...	+ ·08	- 0·3	Moderately dry.

The rather remarkable coincidence which appeared in the results for both these regions during the first few months for which cablegrams were received has now entirely disappeared; the above statement shows quite different values for both countries.

Sydney.

As far as Sydney is concerned, during December temperature was mild, being 0·3 below normal. Humidity and the resulting rainfall were also in defect, the former to the extent of 4·4 per cent. and the latter to the extent of 0·88 inch. On the other hand, pressure was above normal to the extent of 0·08 inch.

1906.

Taking the year as a whole, the average temperature for Sydney was 63·6 degrees, or 0·6 degree above the normal. As the summer months were milder than usual this excess in the yearly mean may only be ascribed to the unusually high temperatures which prevailed during the winter months. The following statement shows the departures from normal for the year just ended, and also for the previous year :—

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1906 ...	- 0·4	+ 1·3	- 1·3	+ 3·1	+ 2·2	+ 1·6	+ 1·7	- 0·2	- 0·8	+ 1·6	- 1·2	- 0·3
1905 ...	+ 1·1	+ 0·1	+ 0·2	+ 1·3	+ 1·2	+ 0·1	- 0·5	- 0·4	· 2·9	- 4·4	+ 0·8	- 1·9

Distribution of Rainfall during the Year 1906.

H. A. HUNT,
Acting Meteorologist.

January.—After the 2nd, heat steadily accumulated inland, and reached a culmination over southern districts on the 5th and 6th. On the latter date, Wentworth registered 119 deg., Menindie 118 deg., Deniliquin 117 deg., and Wilcannia 116 deg. The heat was even more pronounced over Victoria—there Mildura registered 124 deg. and Swan Hill 120 deg. After the 6th the wave gradually travelled northwards, and on the following day Carinda registered 121 deg., while Brewarrina showed 120 degrees. This great heat was accompanied by a relatively high humidity, which made it very enervating, especially in our coastal districts. After the 8th the weather throughout the State became unsettled and thunderstorms more general; these gradually effected a considerable drop in temperature. After the 15th, stagnant conditions set in over the State, and heat again steadily accumulated, the highest registrations being attained on the 23rd and 24th. On the former date, Euston showed 120 deg., and on the latter date, when the wave was apparently travelling northwards, Brewarrina registered 121 deg., while Bourke recorded 120 deg. The latter part of January was remarkable for violent local storms. Taking the month as a whole, the rainfall was generally deficient. The greatest defects occurred over western, southern, and coastal districts, where the deficiencies often approached 100 per cent. below the average. Only at a few scattered places on the tributaries of the Upper Barwon were the registrations above normal.

February.—This month shows a decided improvement upon its predecessor, being more temperate and favourable as regards rainfall Excepting in the extreme north-west, at Tibooburra and Milparinka, where no rain fell, registrations were above normal at all stations over the western half of the State, some parts of southern and northern tablelands, and on north coast rivers. Otherwise, registrations were generally below normal over central and eastern districts. At many stations over these areas the defects approached 100 per cent. below normal.

March.—This month opened with our State participating in one of the best and most opportune storms on record, lasting, with slight interruptions, from 27th February to 13th March, while the whole of New South Wales benefited. Some of the falls over the western districts were of a phenomenal character. Nyngan during these few days recorded a total of 12·09 inches, which comes near the average for the whole year at that station, the average for the year being 15·14 inches. In the far north-west, on the Queensland border, Hungerford registered 8·51 inches,

which may be compared with an annual average of 12·60 inches for that station. Over the whole of the State it may be said that the falls received were, in a majority of cases, from 3 to 4 inches or over that amount. Some notable exceptions, however, occurred, the greatest defects being over the Sydney catchment area, Hunter and Manning, and in the vicinity of Goulburn. At the latter station the amount received totalled only 75 points. Taking the month as a whole the registrations over the State were, with a few exceptions, considerably above normal. The greatest excess occurred at Moulamein, which station registered 689 per cent. above; Bateman Bay also registered 542 per cent. above. Elsewhere the falls were, in a great number of cases, over 100 per cent. above normal.

April.—This month stands in strong contrast to its predecessor. Registrations were above normal only over south-western slopes, Macleay and Hunter Rivers, and also along a narrow strip of country extending between Coonamble and Bundella; otherwise, falls were generally much below normal. Over the greater part of the western division, very few stations recorded amounts above ½ inch, and at a great many stations no rain fell.

May.—Abundant rains fell over the western half of the State; in some cases the registrations were nearly 400 per cent. above normal. Smaller excesses above the average were also recorded in coastal districts between the Shoalhaven and Hunter Rivers, and at isolated places elsewhere; but registrations were generally below normal over the eastern half of the State.

June.—Rainfall distribution during this month was somewhat erratic, and over the greater part of the State below normal, the greatest defects being recorded in coastal parts, where registrations approached 100 per cent. below normal. South of Sydney, the total amount recorded at each station was generally below the ½ inch.

July.—The relatively droughty conditions prevailing during June have been further intensified this month, which must be classified as an exceptionally dry one. Only at a few isolated places did the rainfall exceed the normal, while at a great number of stations no rain fell.

August.—The first half of this month was very dry, but thereafter a considerable improvement set in. Taking the month as a whole, the rainfall distribution must be classified as one of the best on record, the total fall at a majority of stations being in excess of the normal, and the excess in some instances being very great, especially over the upper tributaries of the Barwon River, where Boggabilla received a total of 435 per cent. above the average. On the Blue Mountains, Lawson had 150 per cent. above the average. Kurrajong Heights also received 246 per cent. above the average, while further northward, on the Macleay River, Kempsey recorded 250 per cent. above average. Some relatively dry patches, however, occurred between the Lachlan and Murrumbidgee Rivers, over the south-western slopes, extreme south coast, and also west of the Darling River. Over these patches the fall was generally below normal.

September.—Rainfall distribution during this month was again remarkably good. Over the greater part of the State the total fall was considerably above the average, especially over districts west of the mountains, where excesses were recorded from 400 to 600 per cent. above the average. Coastal districts, however, showed a moderate defect; only between the Manning and Clarence Rivers was the fall above the average.

October.—Taking this month as a whole, rainfall was useful, and at a majority of the stations, especially over northern and central parts, the falls were above the average. Hungerford, on the Paroo, showed an excess of 232 per cent., while Bourke had an excess of 135 per cent. above the average. Over the greater part of Riverina, south-western slopes, and southern highlands, the falls were uniformly above the average, ranging from 25 to 195 per cent. above. A slight defect occurred over extreme western, coastal parts, and highlands; the falls in these districts, although good, were generally below the average.

November.—The rainfall was most beneficial during this month. Only at stations in farther parts of western division, Upper Barwon tributaries, and coastal parts, was it below normal. At some places in central division the excess was very marked. Nundle recorded 180 per cent. above normal. Out on the Warrego, Barringun had 85 per cent above normal. Even in coastal parts, although the falls were generally below normal, still they were of a useful character, many of the stations recording 2 inches and over.

December.—This month shows a rather erratic distribution of rainfall, probably due to the fact that the falls were generally associated with thunder. As an instance, it may be mentioned that Yass received a total of 95 per cent. above the average, while Gunning, at a distance of only 19 miles therefrom, received 30 per cent. below average. Again, Queanbeyan received 4 per cent. above average, while Michelago, 24 miles to the south, had no rainfall. Speaking generally, falls were below average, and in some cases very much below. Out on the Warrego and at Michelago no rain fell, while at many stations registrations approached or exceeded 90 per cent. below normal. On the other hand, records were above normal over Riverina, central-western slopes, southern highlands, north coast parts, at isolated places over northern tableland, and also in the vicinity of White Cliffs and Byrock.

1906.

Taking the year as a whole, the distribution has been of a most favourable nature, especially over the whole of the districts west of the mountains and extreme north coast parts, over which areas registrations were above normal. A large area drained by the Lower Murray, Murrumbidgee, and Lachlan, also Paroo, Bogan, and extreme north coast parts, received totals varying from 50 to nearly 100 per cent. above normal.

The year has also been an unusually favourable one by reason of the absence of parching winds, destructive storms, or flood rains, excepting,

however, portions of Riverina and extreme north coast, where overflows or very heavy rains occurred in early part of year. Tweed River Heads registered a total of over 125 inches for the year. On the other hand, coastal and mountain districts have been unusually dry; the total registrations there for the year vary from 20 to 30 per cent. below normal.

Taking the subdivisions of the State, the distribution for the year appears as follows:—

		Percentage above or below average.
Over	Western Division	From 4 to 99 above.
,,	Riverina	,, 9 to 99 above.
,,	North-western Plain	,, 5 below to 29 above.
,,	Central-western Plain	,, 1 to 50 above.
,,	North-western Slope	,, 18 below to 11 above.
,,	Central-western Slope	,, 3 below to 23 above.
,,	South-western Slope	,, 6 to 63 above.
,,	Northern Tableland	,, 11 below to 6 above.
,,	Central Tableland	,, 27 below to 22 above.
,,	Southern Tableland	,, 31 below to 32 above.
,,	North Coast	,, 11 below to 84 above.
,,	Hunter and Manning	,, 5 to 52 below.
,,	Metropolitan Area	,, 31 to 53 below.
,,	South Coast	,, 2 to 57 below.

HAWKESBURY AGRICULTURAL COLLEGE.

MONTHLY WEATHER REPORT.

SUMMARY for December, 1906.

Air Pressure (Barometer).			Shade Temperature.				Air Moisture Saturation = 100.			Evaporation (from Water Surface).			
Lowest.	Highest.	Mean.	Lowest.	Highest.	Mean.	Mean for 14 years.	Lowest.	Highest.	Mean.	Most in a Day.	Total for Month.	Monthly Mean for 8 years.	% of year's Evaporation.
29·71 3rd.	30·32 29th.	30·06	47·2 27th.	102·6 17th.	71·21	72·07	20 11th	90 12th.	57·5	·426 10th.	6·961	6·308	15·1

Rainfall...											Mean Rainfall
Dates	6	9	12	13	18	19	20	25	28	Total,	for 14 years,
Points..	2	2½	16	1	29	3	1	42	7½	104.	264 points.

Wind	N	NE	E	SE	S	SW	W	NW
	5	24	3	4	8	4	2	1

Thunderstorms on 1st, 8th, 18th.

Greatest daily range of temperature, 45·8° on 10th.

Days on which temperature rose above 90°	6	7	9	10	11	15	16	17	22
	90	99·9	92·1	100·3	92·7	90	102	102·6	91

SUMMARY FOR 1906.

	Rainfall.	Evaporation from Water Surface.	Mean Temperature.
	inches.	inches.	
January ...	2·31	5·66	72·80
February ...	·71	4·62	73·22
March ...	3·30	4·04	67·12
April ...	·15	3·64	65·62
May ...	1·64	2·50	57·91
June ...	·61	2·09	53·36
July ...	·11	2·55	50·17
August ...	2·90	2·26	51·29
September ...	·95	3 08	56·91
October ...	1·81	5·58	64·91
November ...	1·62	5·95	65·35
December ...	1·04	6·96	72·07
	17·16	48·98	For year, 62·56

Average rainfall for 26 years—30·821 inches.

Mean yearly rainfall :—Highest recorded, 1892 ... ... 50·24 inches.
Lowest ,, 1906 ... ... 17·16 ,,

Mean yearly temperature :—Highest recorded, 1902 ... 63·12°
Lowest ,, 1893 ... 61·87°

College records commenced January, 1893.

*1906—the driest year recorded for the district (over a period of 26 years).

W. MERVYN CARNE,
Observer.

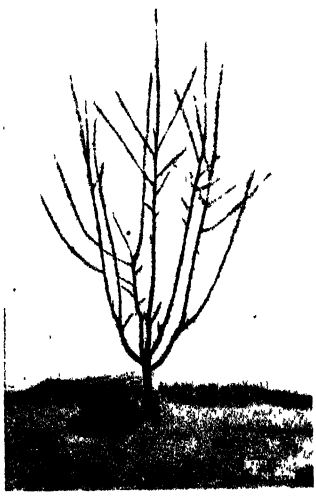
* Mr. Tebbutt, of Windsor Observatory, reports 1906 as the driest year since he commenced taking records, 1862.

Orchard Notes.

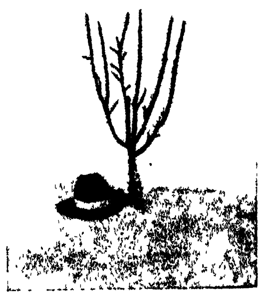
W. J. ALLEN.

February.

Fruits for drying purposes promise to be late in ripening this year, and unless we get a good spell of dry, hot weather in the autumn, sultana and raisin growers may again find some difficulty in curing their fruit. It would be well, therefore, for them to make some preparation for evaporating them, should the weather conditions prove unfavourable for sun-drying. Any hot-room where the air circulates freely will serve the purpose for finishing off the fruit, provided it can be fairly well dried in the sun. There are few evaporators in use at present where such grapes



Young Apple Tree at Glen Innes Orchard two years after planting. Before pruning.



Same tree after pruning.

could be cured properly at a reasonable cost if they had to be taken direct from the vine to the evaporator without having been first exposed to the sun and partially cured.

Where irrigation is practised, see that the trees and vines are given a good soaking if they require it, but in most cases during normal seasons vines should not require any further watering, as, in the case of raisin grapes, it would retard the ripening period, which is precisely what we wish to hasten. It may help dessert varieties intended for marketing

late in the fall or early winter. In every case where trees or vines are watered, see that the land is thoroughly cultivated immediately it is dry enough to work.

It will be well this month to keep a close watch over all kinds of trees, and wherever scale of any kind is found, use every effort to destroy same, either by fumigating or spraying, using any one of the many mixtures which have been found by previous experience to do the best work. For the destruction of San José scale in deciduous trees, there is no better spray for this season of the year than the resin and soda wash, and for citrus trees fumigation is the easiest means of ridding the trees of all scales; but wherever brown scale or white louse are found in the trees, it is best to increase by one-fourth the strength of the charge, as given in the Number 2 fumigating table published about three years back. Growers who intend to practise fumigation would do well not to treat the trees on hot days, but to do the work on cool days, at night time, or in the early mornings and evenings. In measuring the size of the tree, take the extreme height and width before referring to the table to ascertain the quantities of chemicals to use, and be sure not to add the cyanide to the mixture until after the sulphuric acid and water have been put in the bowl or generator, and the latter placed under the tent; then drop in the cyanide and close the tent immediately. Great care must also be exercised not to allow any of the sulphuric acid to come in contact with either the hands or clothing, as it will make the hands very sore, and if it touches the clothes or tents it will burn holes in them.

Keep the cultivator at work this month, and in this way keep down all weeds, as also the land in a fine state of tilth.

The early part of the present month is the best time to bud to better varieties all poor and worthless varieties of fruit-trees found growing in the orchard. Do not allow an unprofitable tree to remain there another year. Be sure that the buds used are taken from trees that have borne the very best quality of fruit, and do not forget that, in the case of peaches, the good canning varieties always find a ready sale at remunerative prices.

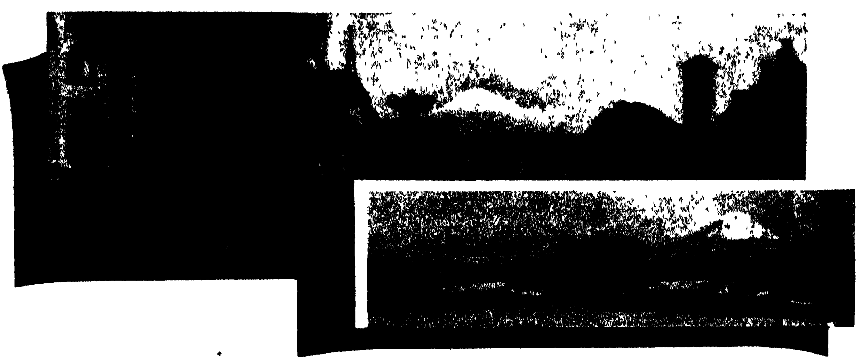
Continue to fight the codling moth by picking up and destroying all fruit found underneath the trees and seen to be infested with the moth, and give regular attention to the bandages. Arsenate of lead will, I believe, become the most popular spray for the destruction of codling moth, when it is sold cheaply enough for growers to be able to afford it. At present it is 1s. 6d. per lb., and as it takes from 3 to 5 lb. to the hundred gallons, it is too expensive; but I have heard on very good authority that there is a likelihood of its being placed on the market at 6d. per lb.; if this is so, it will soon be more largely used, and all that is required is to mix it with cold water, and there is no fear of it damaging the foliage of the trees; no lime has therefore to be mixed with it, and it is an easy spray to put through the machine, as there is nothing to clog up the nozzles.

There is a new spray machine on the market now which, if it will do all that is claimed for it, will take the place of all spray pumps, being simplicity itself—does not require any pumping, and gives a good pressure. It is called the Tyree Automatic Spray.

Pick up and destroy all fly-infested fruit.

Towards the end of the month arrangements should be made for sowing leguminous crops, such as are required for green manuring; and as the fall and winter are the only seasons when such crops can be grown among the trees without robbing them of moisture, it is best to sow only such varieties as will make a fair growth during the cooler and cold months. Such crops as grey field-peas, tares, &c., are depended on to furnish nitrogen and organic matter to keep the soil in a high state of fertility.

Mr. Wagner kindly left specimens of the following varieties of apples at the Department of Agriculture, viz., King, Commerce, Spy, Winesap, Missouri Pippin, Canada Red, Gennetten, Newtown, Baldwin, Rhode Island Greening, White Winter Pearmain, Jonathan, Rome Beauty, Delaware Red, Arkansas Black, Black Ben Davis, Spitzenberg. These apples were grown in Washington Territory, United States, and were shipped to Sydney *viâ* Vancouver, B.C. They were in splendid condition and very highly coloured, and were in every respect a very attractive collection.



Practical Vegetable and Flower Growing.

W. S. CAMPBELL.

Directions for the Month of February.

Vegetables.

VEGETABLE gardens in many parts of the State, where there have been good downfalls of rain, should be well supplied with vegetables during the month of February. About the end of next month (March), autumn is supposed to set in, but the seasons are by no means well defined, and the weather might be quite like summer until April. However, preparations should be made for autumn and winter, it being advisable always to look well ahead in gardening as well as in farming matters. The very oldest writer known on agriculture, who lived about the time of Homer, some 900 years or so B.C.—the poet Hesiod—wrote:—

> "He" (the farmer) "who with doubts delays his work,
> With losses often wrestles."

This is applicable to-day as it was 900 years B.C., and deserves to be committed to memory by all who are producers from the soil.

I have been making trials of new kinds of tomatoes—some half a dozen or so varieties. The small patch of ground available is poor in the extreme, about 98 per cent. of sand, like sea-sand—indeed, it has been blown over from the sea-beach—but the tomatoes have succeeded very fairly considering the drawbacks they suffered from. I used all the vegetable rubbish I could lay my hand upon, a little horse-dung, leaves, mowings from the lawn, &c.; some castor-oil cake manure, and a mixture of Shirley's general manure and blood and bone manure—about a handful of the mixture to the square yard. Next month I hope to have some illustrations from photographs published in the *Gazette*, showing some of the tomato plants, more with a view to show the system of training adopted than anything very remarkable about the plants, for I find in most of the vegetable gardens I happen to see in many different parts of New South Wales that it is rare indeed to see any system of training adopted at all. Of the tomatoes experimented with, I find Imprived Duke of York to be about the best. Sunrise is excellent, bearing the most beautiful and richly-coloured fruits of any tomato I remember. Duke of York bears bunches containing six, eight, and even nine fruits, of fair inclining to large size, smooth and well coloured. The fruits of Sunrise are not quite so large, but they grow in bunches up to as many as nine fruits. It is quite possible that, had I time to attend to the pollination of

the flowers, more fruits would have been produced. Another promising tomato is Eclipse, which also produces as many as from six to nine tomatoes on each bunch, smooth, and of good size; but it is rather later, with me, in ripening than the other two, so that I can hardly yet judge of its merits. Winter Beauty resembles Sunrise in appearance, and is a variety well worth growing. Its bunches are very pretty, and it is worth growing, if well trained, for ornamental purposes alone. Satisfaction, Best of All, and A1 will, I believe, all prove good; they are only just colouring. I grow some of these—chiefly Sunrise and Winter Beauty—in pots, just for ornament, and they are extremely handsome when the bright-scarlet fruit is ripe. I should think that the Improved Duke of York would be a good tomato for market growers, as well as for those for whom I am writing these directions, who grow vegetables for their own use.

Beans.—All kinds of beans, except the broad or Windsor bean, may be sown as extensively as may be required, and all old beans which are no longer bearing should be removed, and some other kinds of vegetable sown or planted in their places.

Beet (Red).—Sow a few rows of this vegetable, which is so good that no one with a vegetable garden should be without it. The globe varieties are the best kinds to grow, and are likely to keep their shape better than the long-rooted kinds. Sow the seed in drills about 18 inches apart. As the seed generally takes a long time to germinate, or "come up," it had better be soaked in water for a few hours before sowing; and then the ground had better be watered well after sowing—that is, if it be dry. If nice and moist, you need not bother about the watering. Should the seeds come up thick, thin out the plants well, so as to give them plenty of room to grow. Use a hoe of some kind pretty freely amongst the beets, and they should grow well and speedily.

Beet (Silver), sometimes known as spinach, is a fine vegetable, and a most useful one for summer use. The seed may be sown in a seed bed, and the young beets planted out when they are large enough to shift; or, it may be sown in drills like the red beet, if preferred. The soil should be made rich with good manure for this vegetable, and if some liquid manure be supplied during its growth occasionally, if it does not seem to be growing as it should, it is likely to be much improved.

Cabbage.—There should be sufficient young cabbages on hand for successive plantings during the month—a few at a time. This successive method is a perpetual-motion sort of business. Once get it in order, it is easy to manage. Sow a little seed; plant pricked-out plants which are large enough to a heavily-manured bed. The best hoe to use for a small garden is a medium-sized Dutch hoe, kept in good order. For a good-sized garden obtain a Planet Junior hoe, which is an extremely useful implement, for with its various attachments all sorts of operations can be carried out at a minimum of labour.

Cauliflower and *Broccoli* can be treated in much the same way as cabbage. Both are great feeders, and need good manure in abundance, and they should be grown without any check whatever. It is worth while taking some extra care with these vegetables, for they will well repay it. Sow seed of both, but not too much at a time.

Celery.—Sow a very little seed in a pot, seed-pan, or box. A kerosene tin will serve the purpose just as well, if not better; but some holes should be made in the bottom, so as to allow surplus water to drain away. Seedlings should be pricked out like cabbages for transplanting when they have grown to a height of 6 inches or so, or they may be moved when very much larger; but a good many of the roots and leaves should be trimmed off before planting. Earth-up well-grown plants, taking care not to allow any soil or dirt to fall in between the leaf stalks. Use liquid manure occasionally, and plenty of water if the soil is at all dry.

Cucumbers, Pumpkins, Melons, Squashes, Marrows, may be sown if a further supply of these kinds of vegetables are needed; but the sowing had better be taken in hand as early in the month as possible.

Kale, known also as *Borecole,* is a good and useful vegetable which will sometimes succeed well where its relative the cabbage will not do nearly so well. It prefers cold climates to warm and dry, and if it be just touched with frost it will be improved for the table. It is not often grown here, but it deserves a trial. Like all the cabbage tribe, it is a gross feeder, and needs good soil, or abundance of manure, if it be desired to grow it to perfection.

Leek.—Plant out a few, if any young leeks are ready to shift. Feed all growing leeks liberally, for they are greedy feeders and need abundance of water if the soil be at all dry. Sow a little seed.

Lettuce.—Sow a few short rows from time to time in beds where the lettuces are to grow, for it is better not to transplant lettuce during the summer, for then they have greater tendency to run to seed than if grown without a shift. Manure well, water well if dry, and keep clear of weeds.

Maize (Sweet).—A few seeds may be sown if any more of this vegetable is required, but it is probably too late to sow anywhere except about the coast.

Mustard and Cress.—Sow, now and then during the month, a little seed of these useful salad plants. If dry weather should set in, the plants should be watered frequently, and some liquid manure should be given them occasionally.

Onions.—Sow a little seed, and cultivate well any young onions that are coming on. Any that are ready for digging—that is, when the leaves have withered up—should be taken up carefully and dried in a shady place, and not in the sun.

Potatoes.—Plant a few rows during the month. Take care that the sets are free from scab and potato-moth. Use plenty of manure for the potato, unless the soil is rich naturally, when manure may not be needed at all.

Radish.—Sow a little seed occasionally during the month, and make use of the radishes whilst they are young and tender.

Rhubarb.—Those who would care to raise rhubarb plants from seed can do so this month. The plants raised now will be ready for putting out in the early spring.

Spinach.—Sow a little seed.

Sweet Potatoes should be growing well now if kept free from weeds. In warm localities rooted cuttings may be planted, if desired, with good prospects of a successful crop. See that the drainage is good.

Tomatoes, Egg-plants, Okra, and *Capsicum* seeds also may be sown if supplies are required. These seeds had better be sown without delay.

Turnip.—Sow a little seed in drills.

Flowers.

As autumn approaches arrangements should be made for the planting of cuttings of roses and other garden plants. The ground for them could be prepared at any time now, for there is but little to do in the flower garden during the month beyond keeping down weeds, cutting grass, trimming hedges, and so on, and making things tidy generally.

Bulbs of spring-flowering kinds, such as daffodils, ixias, &c., may be planted at any time during the month, or even later, if necessary.

Seeds of pansies may be sown in pots, boxes, or seed-pans, to raise seedlings for planting out.

Farm Notes.

Hawkesbury District—February.

H. W. POTTS.

THE weather conditions continue adverse to farming operations. The condition of the Hawkesbury Valley is not likely to be forgotten. In point of severity the drought this season has not been exampled in the history of the oldest inhabitant. It is difficult to point to a single crop, excepting cowpeas, which has not been stunted in growth, and in the majority of cases a complete failure.

Cattle Cabbage, Kale, and Kohl Rabi.—The land may now be got ready for these useful crops. Farmyard manure affords the best results as a fertiliser; failing this, a complete commercial fertiliser may be used of superphosphate, kainit, and sulphate of ammonia.

Cereals.—The main crops for spring have to be considered now, and all paddocks available prepared by preliminary cultivation. In many instances the stubbles from the last crops were turned in immediately after harvest. Owing to the drought, no summer crops were put in, and the land has been in fallow. In such case, these may be laid down in crops to provide early feed in a green state. A judicious selection should be made, with this object in view. Wheat, barley, and oats, either alone or sown with vetches, will be the best. A continuous succession may be dealt with.

Lucerne.—Where opportunity offers, it will be advisable to prepare land for lucerne. The addition of lime brings the soil into a more fertile condition. The best form of lime is gypsum, and it may be applied at the rate of 10 cwt. per acre. Next month the land should be subjected to complete and thorough tillage.

Maize.—In some cases along the river bank there may be enough moisture to ensure germination, and a late crop may be risked to sow for green feed or ensilage, with the chance of early autumn rains.

The outlook for feed for dairy cattle during the winter is not promising, and points to the farmers taking apparently hopeless risks in making provision now with quickly-maturing varieties.

Those crops of maize which have not been eaten off, although stunted, may be cut for ensilage this month. In preparing it, the main point to note under existing conditions is that it ought to be chaffed, and packed very closely. Where the stems are very dry, it will be advisable to sprinkle water through it to ensure sufficient fermentative action.

Millets.—Should rain fall this month, we may seize the opportunity to sow the last crop of millet, White French or Hungarian. Some risk is

accepted in this case also, but the circumstances are exceptional. The former variety is noted for its rapid power of germination and growth. It has been known to give an 8-ton to the acre crop of green food in sixty days. This will avoid the early frosts, to which millets are especially susceptible.

Potatoes.—The last crop was a complete failure. Many farmers will not secure enough potatoes for seed purposes; others have simply ploughed the crop in. Should sufficient rain fall within the next few weeks, a second or autumn crop may be put in.

Pumpkins and Squashes, where these have passed through the dry season, may be further encouraged by cultivation. Mulching with farm-yard manure will assist in checking evaporation, and stimulating the plant. This applies particularly to the bush marrows, which have exhibited a good power to resist drought.

Rape.—This excellent fodder catch-crop is becoming rapidly popular, owing to its value for sheep and pigs. Should conditions prove favourable, an early sowing may be made after getting the soil into a fine condition with cultivation. It will be good practice to sow in drills 2 feet apart, 4½ lb. to 5 lb. of seed to the acre. The Dwarf Essex variety gives the most satisfactory yields. Should broad-casting the seed be adopted, 8 lb. to the acre will be required. Where the soil is light and requires a fertiliser, the best is two parts bone-dust and one part blood manure, 2 cwt. to the acre.

When it is borne in mind that this crop, with proper moisture, will give a yield of 10 or 12 tons to the acre of a relishable and succulent fodder in twelve to fifteen weeks, we can readily realise what a boon it will be in the autumn.

Sorghum.—Sowings of Ambercane may be made now. The soil is dry, both in surface and subsoils; but we are warranted in advising this course, with the possibility ahead of a suitable rainfall. Should the drought continue, a loss must follow. In any case the seed will germinate rapidly, and on the appearance of the plant shallow cultivation must be kept up continuously. Every effort must be made to keep the young crop growing. The plant is very sensitive and delicate in the early stages of growth, more so than young maize. As the plant matures, it becomes more sturdy in habit, and is able to thrive through hardships which would be fatal to maize. This is especially noted in late autumn during the first period of low temperatures. Sorghum will remain green and succulent up to the middle of July under normal conditions. This crop thus deserves special attention this season, seeing we will have to depend on it for green feed when other crops are out of season.

The Ambercane variety is noted for its hardiness and power to resist early frosts. It has often given up to 10 and 12 tons of green forage to the acre here, and whilst it will be too much to expect this season, yet a fair crop can be grown with assiduous attention during the next six weeks.

Sweet Potatoes.—The drought this season has adversely affected the earlier-planted crops, and the yield in consequence must be low and very disappointing. This plant as a rule defies dry seasons. The present one, with its absence of subsoil moisture, has shown its effects fully on the edible tuber. Further May plantings may be made during the month.

Glen Innes District—February.

R. H. GENNYS.

EVERY endeavour should be made to prepare for the coming sowing season. Where the land is intended for wheat, and is clean and free from weeds, a deep ploughing will be found the best; then, later, a second shallow ploughing will put the land in the best condition for seeding. On the other hand, if the land is at all dirty, a shallow ploughing, just sufficient to germinate the weed seeds, is the practice recommended. The growth that will result from this ploughing should be eaten off with sheep or be buried by a second ploughing. The importance of getting the land clean cannot be over estimated, and no stone should be left unturned to achieve this end.

Land should be got ready for grasses and lucerne.

Barley.—A sowing of either Cape or Skinless Barley for green feed should be made; the latter should be sown more thickly than the former as it does not stool well.

Rape, Tares, &c.—For winter feed sow rape, tares, &c. Rape requires fairly rich land which must be well cultivated; the seed requires a fine bed, and should not be covered deeply. It is rather difficult to sow broadcast, but with a drill a more even distribution of seed is obtained; about 3 lb seed if drilled and 6 lb. is broadcast is sufficient to the acre. Dwarf Essex Rape is a good variety.

Rye.—This may be sown for green feed, Emerald and Mammoth being recommended in this connection.

Turnips.—A sowing of swedes and white turnips may be made for a general crop this month. Sheep can be topped up on these if desired, and if eaten in the field the manure from the sheep will make up nearly all the plant food taken from the soil; if taken off for sale turnips are an exhausting crop.

Vegetables.

If any seedlings of cabbage or cauliflower have been raised they should now be planted out in rich well worked land, and the land kept free from weeds and well hoed. Onion seed may be sown on carefully-prepared land. Sow thinly in drills; keep free from weeds, and thin out later.

Crown Lands of New South Wales.

THE following areas will be available for selection on and after the dates mentioned :—

FOR CONDITIONAL PURCHASE LEASE—(Available under Section 10 of Act of 1905. Regulations 356 to 365. Applications to be made on Form No. 114).

C.P.L. No	Name of Land District	Holding.	Total Area	No of Blocks	Area of Blocks	Distance in Miles from nearest Railway Station or Town.	Annual Rental per Block.	Date available.
			acres.		acres.		£ s d.	
47	Urana	Brookong	6,877	14	480 to 512½	Lockhart, 2½ to 7	24 0 0 to 27 0 0	1907. 14 Feb.

The country generally is flat to ridgy, with red clayey loam and red sandy loam; the land is partly thick and partly open forest, timbered with ringbarked box, clumps of dogwood, and needlebush; also pine of sapling growth; practically the whole is suitable for agriculture; good breeding and fattening country; rainfall about 17 inches.

48	Windsor	..	.....	1	91	Windsor, 8 ..	11 7 6	14 Mar.

About one quarter of the area is swampy, about half the balance sandstone country, with outcrops of rock; the remainder gently undulating to flat, and suitable for cultivation, timber—stringybark, ironbark, gum, and tea-tree, water in swamps, except in dry seasons

FOR ORIGINAL CONDITIONAL PURCHASE ONLY.—(Classified under Subsection 1 (A), Section 4, of Crown Lands Amendment Act, 1905.) Available under Section 26 of Act of 1884. Regulations 74 to 130. Application and declaration to be made on Forms 21 and 22.

Name of Land District.	Name of Holding, &c.	Parish	County	Total Area.	Price per Acre.	Date available.
				a r p.	£ s d	1907.
Bellingen		North Bellingen	Raleigh	700 0 0	1 5 0	14 Mar.

Suitable for dairying, &c

Casino* .	Casino Population Area.	North Casino .	Rous .	100 2 0	2 10 0 and 3 0 0	7 Feb.

Being portions 285 and 286; light sandy soil, undulating ridges, grassed with natural pasture; hardwood timber, suitable for building and fencing.

Gunnedah* ..	Gunnedah Population Area.	Gunnedah . ..	Pottinger ..	300 0 0	2 10 0	7 Feb.

Gently undulating country of basaltic formation; soil - loamy chocolate and some gravel; timbered chiefly with box, wilga, budtha and belah, part scrub; sound fattening country (if cleared), and suitable for agriculture. Being portions 89, 90, 91, 105, 106, and 107, of 50 acres each.

* Identical with Special Area, see page 191.

For Original Conditional Purchase and Conditional Lease in virtue thereof.—(Classified under Subsection 1 (b), Section 4, of Crown Lands Amendment Act of 1905); available under Sections 26 and 48 of Act of 1884. Regulations 74 to 130. Application and declaration for Original Conditional Purchase to be made on Forms 21 and 22, and for Conditional Lease on Forms 95 and 96.

Name of Land District.	Name of Holding, &c.	Parish.	County.	Total Area.	Price per Acre.	Date available.
				a. r. p.	£ s. d.	1907.
Condobolin	....	Derriwong ..	Cunningham	117 0 0	1 5 0	14 Feb.
Being portion 26; suitable for grazing and agriculture.						
Lithgow..	....	Thornshope ..	Westmoreland.	996 0 0	0 15 0	7 Feb.
Being portions 80 and 81; suitable for grazing.						
Molong ..	....	Catombal	Gordon ..	383 0 0	2 0 0	7 Mar.
Being portion 125; suitable for agriculture.						
Muswellbrook	....	Oxley ..	Brisbane	240 0 0	1 10 0	21 Mar.
On Krui River; suitable for cultivation.						
Narrabri	.... .	Talluba	Baradine ..	450 0 0	0 15 0	14 Mar.
Suitable for grazing.						
Narrabri ..	....	Doyle .	Jamison .	1,563 0 0	0 15 0	7 Feb.
Suitable for grazing.						
Narrandera	..	Mimosa	Mitchell ..	751 3 0	1 5 0	7 Feb.
Being portions 33, 99, 100, and 102: suitable for grazing and agriculture.						
Newcastle ..	. .	Stowell	Gloucester .	80 0 0	0 15 0	7 Mar.
Being portion 8; suitable for grazing.						
Newcastle .	...	Sutton	Gloucester .	160 0 0	1 0 0	14 Feb.
Being portions 20 and 21; suitable for grazing.						
Newcastle	... ..	Tomaree	Gloucester ..	100 0 0	1 0 0	14 Feb.
Being portion 37; suitable for grazing.						
Singleton ..	.....	Poppong . ..	Hunter	2,840 0 0	0 13 4	7 Feb.
On Pickle Bottle Creek; suitable for grazing.						
Stroud .. .	. .. ..	Crosbie	Gloucester ..	3,300 0 0	0 15 0	21 Mar.
Suitable for grazing.						
Tamworth ..	Within Piallaway and Walhallow Holdings.	Coeypolly .. .	Buckland .	140 0 0 and 210 0 0	1 5 0 and 2 0 0	7 Feb.
Suitable for grazing and agriculture.						
Tenterfield .	Within Tooloon and Woodenbong Holdings.	Kangaroo .. .	Buller ..	540 0 0	0 16 8	7 Feb.
On Beamy Creek; suitable for grazing.						
Tenterfield ..	....	Frazer	Clive .	200 0 0	0 15 0	7 Mar.
On Mole River; suitable for grazing.						
Urana	On Brookong Holding.	Cullivell .. .	Urana ..	350 0 0	1 15 0	21 Mar.
Suitable for agriculture.						
Wyalong ..	....	Back Creek ..	Bland ..	700 0 0	1 8 4	14 Mar.
Suitable for agriculture.						

CONDITIONAL PURCHASE (ORIGINAL OR ADDITIONAL) OR CONDITIONAL LEASE.—(Available by revocation of reserves, and not classified or specially set apart under Section 4 of the Crown Lands Amendment Act of 1905.) Available under Sections 26, 42, and 48 of Act of 1884. Regulations 74 to 130. Application and declaration for Original Conditional Purchase to be made on Forms 21 and 22, and for Additional Conditional Purchase or Conditional Lease on Forms 95 and 96.

Name of Land District.	Name of Holding, &c.	Parish.	County.	Total Area.	Price per Acre.	Date available.
				a. r. p.	£ s. d.	1907.
Eden	....	Bournda and Panbula.	Auckland .	1,100 0 0	1 0 0	7 Mar.
Windsor.. .	.....	Grono, Colo, and Hawkesbury.	Hunter ..	6,000 0 0	1 0 0	14 ,,

SPECIAL AREAS.

Casino Land District, within Casino Population Area, 100¼ acres, being portions 285 and 286, parish of North Casino, county of Rous; light sandy soil, undulating ridges, grassed with natural pasture, hardwood timbers, suitable for building and fencing; price, £2 10s. and £3 per acre. Available for original applications only on 7th February, 1907.

Gunnedah Land District, within Gunnedah Population Area, 304 acres, being portions 89, 90, 91, 105, 106, and 107, of 50 acres each, parish of Gunnedah, county of Pottinger; gently undulating country of basaltic formation; soil—loamy, chocolate, and some gravel; timbered chiefly with box, wilga, budtha, and belah, part scrub; sound fattening country, if cleared, and suitable for agriculture. Price, £2 10s. per acre. Available for original applications only on 7th February, 1907.

AGRICULTURAL SOCIETIES' SHOWS.

1907.

Society.	Secretary.	Date.
Wollongong A., H., and I. Association	J. A. Beatson ...	Feb. 7, 8, 9
Wingham A. and P. Society	Edward Rye ...	,, 7, 8
Shoalhaven A. & H. Association, Nowra	W. Randall ...	,, 13, 14
Moruya A. and P. Society	John Jeffery ...	,, 13, 14
Tamworth A. Association	J. R. Wood ..	,, 19, 20, 21
Pambula A., H., and P. Society	J. B. Wilkins ..	,, 20, 21
Kangaroo Valley A. and H. Association	E. G. Williams ...	,, 21, 22
Alstonville Agricultural Society	W. W. Monaghan	,, 27, 28
Ulladulla A. Association	C. A. Buchan ...	,, 27, 28
Gunning P. A. and I. Society	W. T. Plumb ..	,, 18, Mar. 1
Robertson A. and H. Society	R. G. Ferguson ...	,, 28, ,, 1
Manning River A and H. Association, Taree ...	S. Whitbread ...	,, 28, ,, 1
Nepean District A., H., and I. Society	Percy Smith ...	,, 28, Mar. 1
Tenterfield Intercolonial P., A., and Mining Society...	F. W. Hoskin ...	Mar. 5, 6, 7
Liverpool A., H., and I. Society	W. Armstrong ...	,, 6, 7
Braidwood	L. Chapman ...	,, 6, 7
Bombala Exhibition Society	W. G. Tweedie ...	,, 12, 13
Berrima A. H. and I. Society	J. Cullen	,, 7, 8, 9
Blayney A. and P. Association	H. R. Woolley ..	,, 12, 13
Campbelltown A. H. and I. Society	A. R. Payten ...	,, 12, 13
Central New England P. and A. Assoct'n, Glen Innes	Geo. A. Priest ..	,, 12, 13, 14
Walcha P. and A. Association	S. Hargrave ...	,, 13, 14
Warialda P. and A. Association	W. B. Geddes ...	,, 13, 14, 15
Goulburn A., P., and H. Society	J. J. Roberts ...	,, 14, 15, 16
Newcastle A., H., and I. Association	Owen Gilbert ...	,, 14, 15, 16
Armidale and New England P., A., and H. Associat'n	A. McArthur ...	,, 19 to 22
Gundagai P. and H. Society	A. Elworthy ...	,, 20, 21, 22
Cumnock P., A., and H. Society	A. M. Martin ...	,, 20
Camden A., H., and I. Association	C. A. Thompson .	,, 20, 21, 22
Inverell P. and A. Society	J. McIlveen ...	,, 20, 21, 22
Mudgee Agricultural Society	J. M. Cox	,, 20, 21, 22
Cobargo A., P., and H. Society	T. Kennelly ...	,, 21, 22
Crookwell A., P., and H. Association	C. T. Clifton .	,, 21, 22
Upper Hunter P. and H. Association, Muswellbrook	Pierce Healey ...	,, 21, 22, 23
Royal Agricultural Society of New South Wales ...	H. M. Somer ...	,, 26 to April 3
Yass P. and A. Association	W. Thomson .	April 9, 10
Orange A. and P. Association	W. Tanner ..	,, 10, 11, 12
Bathurst A., H., and P. Association	W. G. Thompson	,, 17, 18, 19
Bellinger River Agricultural Association	G. O. Hammond..	,, 17, 18, 19
Wellington P., A., and H.	A. E. Rotton ...	,, 23, 24, 25
Cooma P. and A. Association	C. J. Walmsley ..	,, 24, 25
Durham A. and H. Association (Dungog)	C. E. Grant ..	,, 24, 25
Richmond River A., H., and P. Society (Casino) ...	E. J. Robinson ..	,, 24, 25
Macleay A., H., and I. Association, Kempsey ...	Ernest Weeks ..	,, 24, 25, 26
Clarence P. and H. Society, Grafton	T. T. Bawden ...	May 1, 2
Lower Clarence A. Society	G. Davis... ..	May 7, 8
Central Australian P. and A. Association (Bourke)...	G. W. Tull ...	,, 22, 23
New South Wales Sheepbreeders' Association ...	A. H. Prince ...	June 24 to 27
National A. and I. Association of Queensland ...	C. A. Arvier ...	Aug. 13 to 17
Murrumbidgee P. and A. (Wagga Wagga)	A. F. D. White ...	,, 21, 22, 23
Junee P. A. and I. Association...	T. C. Humphrys...	Sept. 4, 5
Young P. and A. Association	G. S. Whiteman...	,, 11, 12, 13
Cowra P., A., and H. Association	E. A. Field ...	,, 18, 19,

[1 Map.]

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Agricultural Gazette of New South Wales.

The Nature and Aims of Plant Pathology.*

D. McALPINE.

Introduction.

AT the meeting of this Association in Melbourne in 1890, a committee was appointed at the instigation of the late Mr. F. Wright "to investigate the question of Rust in Wheat," and as a result of this, the Government of Victoria, and afterwards the Government of New South Wales, each appointed a Vegetable Pathologist to deal with this, as well as other diseases of plants due to Fungi. And now, after the lapse of sixteen years, I propose to deal with the subject of Plant Pathology, pointing out its nature and aims and what it has achieved, incidentally referring to Rust in Wheat, and showing what progress has been made in the solution of the question, as well as the problems connected with it and other diseases still awaiting an answer. Pathology has been defined as the science of disease, as distinguished from Physiology the science of health, and Plant Pathology will thus deal with all the diseases of the plant, however caused. But what constitutes disease will require to be considered, for there is sometimes a very narrow margin between being "out-of-sorts" and in perfect health. A departure from the normal life of the plant might be regarded as a diseased condition, but that is what is sometimes actually aimed at by the cultivator, as in the case of the cauliflower which is an abnormal form of the cabbage. So that we will require to qualify the conception of disease as an abnormal condition of the plant, interfering with the use for which it is intended, or threatening its life in whole or in part. It is a derangement of function associated with corresponding changes in structure. It is evident, therefore, that before we can fully understand and appreciate the departure from the normal—this interference with the normal physiology of the plant—we must be conversant with the conditions and results of the ordinary vital activities. In other words, Physiology must be the starting-point for a proper understanding of Pathology or Disease; we must have a knowledge of the normal, before we can detect the abnormal and appreciate its significance.

Early Views on Plant Disease.

When we consider how vague and ill-informed are the views held by many growers, even at the present day, as to the nature and cause of disease, it is not to be wondered at that the ancients had very peculiar notions about it. They often associated it with an offended deity, or regarded it as the working

*A paper read before the Adelaide Meeting of the Australasian Association for the Advancement of Science, January, 1907.

of an evil spirit or humour which entered into the plant and deranged its functions. The mildew or rust of wheat has been known from remote antiquity, and the ancient Romans held a festival in honour of the god Robigus on 25th April—the Robigalia or Rubigalia—and offered sacrifices in order to protect their fields against the disease. The philosophers of Greece and Rome, however, speculated as to the causes of it and Aristotle even noticed the epidemic nature of rust about 350 B.C. In Shakespeare's time it was also recognised in England, for he writes in *King Lear*:—"This is the foul fiend Flibbertigibbet. He mildews the white wheat." Even as late as 1733, Jethro Tull considered that it was caused by insects, and that the black spots upon the straw were nothing but the excrements of the young insects. But the use of the microscope soon exploded the idea, for in 1767, Felice Fontana published an account of the fungus with drawings, and thirty years later Persoon gave it the name which it still bears, *Puccinia graminis*. Although the rust is thus known to be a fungus, it is still so firmly believed by many to be due to the weather, or a special dispensation of Providence, or the oozing out of the juices of the plant, that they refuse to believe in any possibility of counteracting it. Even Jethro Tull, with his imperfect knowledge, was further advanced, for he writes:—"The most easy and sure remedy that I have yet found against the injury of these rusts, is to plant a sort of wheat that is least liable to be hurt by them."

While there is no doubt as to the antiquity of the mildew or rust, the smut of wheat apparently was not known in ancient times, for there is no word to express it in the language of Greece or Italy. It is sometimes considered that the "blast" or "blasting" spoken of in Scripture refers to this disease, but there are others who regard the expression as equivalent to blight. However that may be, the smuts have become celebrated in historical times on account of the different views held as to their nature and origin. Smut was at first thought to be a degeneration of the grain, and atmospheric conditions were generally assigned as the cause. When the spores were observed at first they were regarded as foreign bodies and even taken to be infusoria, but their resemblance to fungus spores was soon recognised. Persoon placed them in the genus *Ustilago* in 1831, and so the rusts and smuts were definitely assigned to the fungi.

But there was still one fatal error which prevented this knowledge bearing fruit, and that was the mistaken idea that the parasitic fungi were not produced from spores or seed-like bodies like ordinary plants, but were diseased outgrowths from the plant itself—morbid conditions (eruptions) of vegetable matter. As late as 1833 this view was put forth by such a good observer as Unger, in his work "Die exantheme der Pflanzen," and adopted by Schleiden even in 1846. The views which prevailed concerning disease in general and smut in particular towards the end of the eighteenth century are well summed up in an article on the subject of smut in the fifth volume published by the Bath Agricultural Society in 1790:—"Premiums offered for preventing evils which originate from intemperate seasons and destroying blights, may excite invention, artifice, cunning, imposture, and deception, but can never extend

the boundary or expand the circle of human knowledge or human power. HE, and HE only, who can repel the malignant blasts of the East, fraught with myriads of consuming insects, which originate from what or where none but Omniscience knows, and substitute the soft, healing, balmy zephyrs of the West, can reward the labours of the industrious husbandman with plenty and happiness."

Plant Pathology as a Science.

It is only within the last forty years that the study of Plant Diseases has advanced sufficiently, and has been placed on such a sure foundation as the result of exact scientific method, as to come within the circle of the sciences. Previous to 1874, when Sorauer wrote his first treatise on the subject, the way was being prepared for modern methods and definite results. Sachs and De Bary had greatly advanced our knowledge of the Morphology and Physiology of Plants, the former by his great discovery in 1860 that the grains of starch in the green chlorophyll-corpuscles were the result of photo-synthesis or carbon-assimilation, and the latter by his brilliant researches into the nature of parasitic diseases and infection, the results of which were given in his work published in 1866, *Morphologie und Physiologie der Pilze*, &c. Berkeley, in England, had also paid special attention to plant diseases, and studied systematically the fungi to which they were due. But it was mainly owing to the methods introduced by Pasteur and Cohn in building up the modern science of bacteriology that such wonderful progress was made. It was not that bacteria were discovered, which accounted for some of our worst diseases in plants, although they bear their fair share, but from the method of "pure cultures" which enabled the parasite to be isolated and grown free from contamination. In the study of the Smuts by Brefeld, and our own researches into Australian Smuts, the study of the spores and their germination and infection are all carried out in sterilised media. Plate cultures are made of the spores which germinate and grow upon nutrient fluids, though occasionally solid media such as agar are used. The water and the nutritive solutions in which the spores are germinated are sterilised by discontinuous boiling on three successive days, and a sterilised plug of cotton wool inserted in the mouth of the flask keeps out the floating organisms of the air and prevents contamination of the medium. It is by such simple and exact methods that definite results are obtained, and that many of our obscure diseases are traced to their causes. Even as late as the middle of last century, disease was regarded as an "abnormal process of cell-formation," and the rust or smut associated with it as "devoid of individuality," while others considered it to be an "independent organism." The present point of view is—and it stands in marked contrast to what has gone before—that the parasitic fungus is as much an individual plant as that on which it preys, and that *both* require to be studied with reference to each other, and to their non-living environment.

Not only has our knowledge of the nature and causes of disease been vastly increased as the result of improved methods of investigation, but in treatments for the prevention of disease there has also been a corresponding

advance. Time would fail me to enter into detail, but in connection with the control of insect pests, fumigation with hydrocyanic acid gas has been found successful, and it is now largely used not only for the destruction of scale insects, but for fumigating nursery stock. Another method successfully used against certain scale insects is to pit Nature against itself by employing the insect parasites which prey upon them, and in this way the orange orchards of California infested with the cottony cushion scale were saved by the introduction of a lady-beetle from Australia. A third method, which is now being extensively used in Australia to reconstitute our vineyards destroyed by phylloxera, is that of grafting *Vitis vinifera* upon hardy American species which are known to be resistant. By crossing, a raisin grape has been obtained, resistant to *coulure*, the non-setting or incomplete development of the grapes.

In the control of many fungus parasites equal success has been obtained, and some of the methods, at first accidentally discovered, have received a wide application by carefully-conducted scientific experiments. The well-known Bordeaux mixture, consisting of bluestone and lime, was originally used by the French peasants to sprinkle over grapes near the roadsides to give them the appearance of being poisoned, and thus prevent the depredations of children and travellers. But it was observed in the year 1882, when the downy mildew had been particularly injurious, that the vines so treated retained their leaves; and Professor Millardet was the first to see the importance of this discovery, and to perfect the mixture for the prevention of mildew. It was at first applied with a broom; but soon it was found effective for other fungus diseases, and spraying apparatus was brought to great perfection. Properly prepared Bordeaux mixture, applied at the right time in the form of a spray, is now recognised as the most generally useful preventive, and is regularly employed for diseases of the vine, potato, tomato, and fruit-trees generally. It has been the salvation of the apple and pear industry when threatened with extinction from the ravages of black spot; and in the single disease of peach leaf-curl alone, in the State of California, it is estimated that it saved £80,000 in one year.

Steeping of the seed of cereals for the prevention of smut was also an accidental discovery. About the middle of the seventeenth century, a shipload of wheat was sunk near Bristol in the antumn, and recovered at ebb tide after a thorough soaking in the sea-water. As it was unfit for making bread, a farmer sowed some of it and it grew well; then the whole cargo was sold at a low price and planted in various districts. In the following harvest the wheat happened to be very smutty, with the exception of the brined seed, and the practice of steeping has since been followed. There must have been some cause for the freedom from smut other than steeping the seed in brine, for I have tried it at Port Fairy without result; but the practice became established, and now various steeps, such as bluestone, formalin, and hot water are found to prevent at least the stinking smut of wheat. Just as insect parasites have been employed for fighting certain injurious insects, so fungus parasites have been tried for the same purpose. Some of our most dreaded

insects, such as codling moth and San José scale, have their fungus parasites, and the spores can be readily disseminated by means of a spray; but their application has not been entirely successful. The germination of the spores and the luxuriant growth of the fungus are so dependent on climatic conditions that they cannot be relied on with the certainty of a deadly chemical spray. Still, there is here a promising field of research, particularly in connection with the codling moth in Australia. Bacterial diseases, such as the gumming of the sugar-cane, can be avoided by the selection of healthy cuttings, as shown by Dr. Cobb; and the breeding of rust-resistant wheats is solving the most serious problem of the wheat-grower.

In avoiding those conditions as far as possible which favour disease, and adopting those which tend to ward it off, the hope of the future lies; and it is safe to predict that, as regards wheat alone--by a proper rotation, by manuring, by irrigation and drainage where necessary, by improved and rust-resisting varieties, and by treatment of the seed for certain smuts—the average yield of the entire Commonwealth could be so raised as to equal that of older lands. Continuous cropping with one crop is a sure means of reducing the yield.

Comparison between Animal and Plant Pathology.

It would seem at first sight as if there was hardly any room for comparison between the diseases which affect the active animal and those which attack the passive plant. The organs and the tissues are so different when looked at from the purely morphological point of view, and the presence of a central organ such as the heart and a nervous system extending to every part, apparently distinctly separates the two.

But there is a general pathology which rises superior to these limitations, and discarding the idea that structural changes are the be-all and end-all of pathology, it lays stress upon the fundamental fact that the investigation of functional derangement and of interference with the normal processes of life is its principal aim.

The causes which influence and bring about these changes are also similar in their nature. There is the large field of what has been called "bacterial pathology" in which bacteria are recognised as causes of disease both in plants and animals. No doubt bacteriology in its relation to animals has hitherto received much more attention than in its relation to plants, but there is now considerable activity in this line.

Bacteria are chiefly of interest in connection with the diseases of man, such as typhoid, tuberculosis, diphtheria, and cholera, and they are not usually associated with the diseases of plants, but at present quite a number of serious diseases due to this cause are recognised. Mention may be made of apple and pear blight, sorghum blight, gumming of the sugar-cane, black rot of cabbage, bacterial blight of tomato, and bacterial shot-hole of stone fruits. Then the action of microscopic parasites in the causation of disease is being diligently studied both in plants and animals. Malarial fever is is now known to be due to parasites in the blood, and the spores of the parasite are transmitted from sick to healthy persons by the bite of a

mosquito. Yellow fever is conveyed by another mosquito, and sleeping-sickness by a tsetse fly. Diseases in plants, such as rust and smut, are due to parasitic fungi, and insects are often carriers of infection, so that in many of these diseases the part played by insects must not be overlooked.

The late Sir James Paget, in an address before the British Medical Association in 1880 on "Elemental Pathology," pointed out that there were many points of resemblance between the morbid processes in plants and animals, but that in the former, owing to the absence of a central distributing organ or heart and of a definite nervous system there was an opportunity of studying the various changes induced by disease in a simpler or more elementary form than in the latter. After referring to the repair of injuries and fractures in both, to hypertrophies or overgrowths, atrophies or degenerations and inflammation, he remarked:—"But of all morbid processes in plants, none I think are so suggestive as are those produced by parasites whether animal or vegetable"; he then refers to the changes produced by insects in the formation of galls as illustrating what would be regarded in human pathology as inflammatory hypertrophies. And he goes on to draw a comparison with cancer which may be suggestive at the present time. The gall usually begins to grow immediately after the deposit of the egg, but sometimes there is a delay of many months. "In the case of these long-delayed galls, either the egg, after being laid, requires a long time for the completion of changes ending in the production of the necessary morbid poison, or the plant-structure in which it is laid requires the time for changes to make it susceptible of the poison; or both egg and plant may need to change. So with cancer; a general tendency may be inherited, but it must wait till the material of some structure is, by age, or injury, or long-continued irritation changed into fitness for concurrence in morbid action with the material on which the general tendency depends. Then when the two materials meet in mutual fitness, the result may be a change so great that we may compare it with that from an act of impregnation. I have often thought of this comparison, when seeing the almost sudden appearance of cancer in a breast, or a tongue, or in a scar long irritated." As our knowledge of the deep-seated causes of disease increases, so will our comprehension of the wider field of comparative pathology. The study of animal, including human diseases, has been pursued during the last quarter of a century with almost feverish activity, and the most highly-trained minds with the most exact methods known to science are engaged in fighting and investigating disease. The brilliant results already obtained are but a foretaste of what may be expected, and the plant pathologist is beginning to realise that if he would attain to equal success in unraveling plant diseases he must adopt similar methods. The idea that spraying the plant and steeping the seed is the final goal must be given up, and he must recognise that the living organism, whether plant or animal, is the great object of study. Not only will elemental pathology form a common starting-point, but the younger science of plant pathology will adopt the methods and profit by the progress of its great forerunner.

Some of the Problems of Plant Pathology.

The exact study of plant diseases has only been undertaken towards the end of the nineteenth century, and it may naturally be asked why was the study so long delayed, seeing that plant diseases are as old as the cultivation of plants themselves. Various answers may be given to this question, but I consider that the main reason was that other branches of science were not sufficiently advanced to allow of this being done—that our knowledge of plant physiology and methods of research were too imperfect to enable abnormal physiology or pathology to be properly understood and investigated. To use a cover-slip for microscopic preparations and to substitute thin glass for mica seems at the present time to be so simple and fundamental as hardly to require mention, yet the introduction of this method by Jean Ingenhousz was a great step in advance. Similarly, the isolation of the parasitic fungi and their cultivation in pure cultures is now a common practice, and yet without it many of our worst diseases could not be traced to their causes. And just because plant pathology as a science is of such recent origin, and awaits a more intimate knowledge of the complex chemical and physical processes going on within the cell of the plant, so there are various problems still to be investigated and always will be.

My own studies have led me to deal more particularly with the action of parasitic fungi on plants and I will draw my illustrations from that source. Among the parasitic fung which are most widespread at the present time, and which have been known from remote antiquity to be most injurious to cultivated crops, there are the rusts and the smuts. For convenience, and with special reference to our Australian conditions, the problems connected with the rust and smut of wheat will be specially referred to.

Rust Problems.—The resting spores or teleutospores are known to germinate in the spring on the decaying straw or stubble and to give rise to minute reproductive bodies known as *sporidiola*. These bodies are known in Europe and America to infect the leaves of the barberry and produce the *aecidium* or cluster-cup stage, but in Australia this does not occur and the question arises what purpose, if any, do the teleutospores serve here in the economy of the rust fungus. The *sporidiola* are incapable of infecting the wheat plant directly, and so far as known at present they have lost the power here of infecting the barberry or any other shrub.

Again, *Puccinia graminis* is known on several grasses, such as *Agropyron scabrum*, Beauv., *Bromus sterilis*, L., *Dactylis glomerata*, L., and *Hordeum murinum*, L., but it has still to be determined how many, if any, of these grasses are capable of infecting the wheat-plant. Besides the reproductive bodies other portions of the fungus such as the mycelium may be capable of conveying the disease, and the question arises does it persist from season to season in the seed or other portions of the wheat plant in a form capable of transmitting the disease. One is naturally reminded here of Eriksson's mycoplasm theory, in which it is supposed that in certain cells of the seed the protoplasm is associated with the plasma of the fungus-mycoplasm, and if the

conditions are favourable the mycelium of the rust fungus is developed independent of external infection. Of course one must distinguish here between the source of rust being inside the seed and that arising from spores attached to the surface of the seed. In connection with the rust-in-wheat problem all these are minor questions compared with that of the immunity or susceptibility of the host-plant to the parasite. Why are some individuals susceptible to the disease and others resistant; and why are some more so at one stage of their existence or at one period of the year than another? And bound up with this is the matter of toxins and anti-toxins in the plant, as suggested by Ward; and, when we can answer these questions, when we know exactly the conditions which induce the disease, then we may be able to avoid these conditions and encourage those which make for health. It is better to grow the strong and the healthy rather than to doctor the weak.

Smut Problems.—Up till recently it was considered that smut as a disease was pretty well mastered. In the case of stinking smut or bunt, for instance, we knew that the spores were mixed up with the grain, that they germinated there and produced reproductive bodies which infected the young plant just at the stage when it burst through. Then the fungus grew with the plant until the grain was again produced and the mass of foetid spores was developed by the fungus. By sterilising the seed by means of steeps the spores or their germinating powers were destroyed and the disease did not appear.

But it is now known that there are smuts, such as the naked smut of barley, in which the spores do not infect the young seedling, but do so through the flower, producing the mycelium in the seed. Where such is the case the ordinary treatment does not reach the seat of the disease and these grains, infested with mycelium, will produce smutted plants, and for such cases smut-resisting plants are being experimented with.

The employment of parasitic fungi for the destruction of insect pests, already referred to, is a problem well worthy of immediate attention and the diseases of our native timbers are still practically untouched.

Aims of the Science.

We have now dealt with the nature of Plant Pathology and some of the problems with which it is concerned, and shown that it embraces all those conditions of plant life which interfere with the proper working and complete development of the organism, that it recognises every departure from the normal healthy action which disturbs the equilibrium so that a diseased condition is set up. It is not always easy to tell what constitutes disease, but in practice it becomes evident, from the impaired vigour, the stunted growth, or the failure to produce satisfactory results.

The aims of this science are seen to be of a twofold character—first, a knowledge of causes; second, methods of treatment either to prevent diseased conditions or to mitigate their effects.

The etiology or causation of disease is a necessary preliminary study to the rational treatment of disease, so that these two factors hang together. In tracing the causes of disease in the plant, as well as in the animal, there is

required not only an intimate knowledge of the nature of the organism, both in health and in disease, but also of its environment, of all those conditions which render a plant predisposed to disease, or which tend to render it immune. Much of this knowledge has still to be acquired, but meanwhile the effects of various agencies are being studied, such as soil and climate, light, heat, and moisture among inorganic agencies, and of the various animal and plant parasites among the organic agencies. The co-operation of the chemist, physicist, and the physiologist is required to elucidate these problems, and it is only when this is recognised by our legislators and our University authorities, and the subject is scientifically studied in our seats of learning that the highest and best results will be secured. But meanwhile, and taking into account our Australian conditions, much may be done in helping the producer to secure the full results of his toil. There has been too much haphazard experimenting and waste of energy in the past, and the time is now ripe for continuous, well-directed, and united effort in dealing with a number of those diseases which have hitherto been allowed to continue their course unchecked, and to produce epidemics in season favorable to their development.

Speaking from an experience of sixteen years as consulting Vegetable Pathologist to the Victorian Department of Agriculture, I may say that while successive Governments have realised, to a certain extent, the importance of the subject, and have, in connection with the administration of a Vegetation Diseases Act, encouraged the investigation and treatment of disease, still there has been too great a tendency to expect immediate results without corresponding laboratory and field work, and a want of recognition of that continuity of effort which is necessary to ensure success in the difficult and delicate problems with which plant pathology deals. It is also gratifying to find that in our Agricultural and Horticultural Colleges the subject of plant pathology is being taught, and this encourages the hope that the students sent forth from these institutions will not only know how to grow healthy plants, but also know how to treat them when disease first appears, and before it has become chronic or epidemic.

As an illustration of the official method of dealing with matters pertaining to plant diseases, I may take the rust-in-wheat problem, which is such a burning and practical question for Australia. After the disastrous year of 1889, when the loss to the Commonwealth from this disease alone was estimated at between two and three millions sterling, the different States combined and offered £10,000 for a remedy for the disease. As might have been anticipated from our state of knowledge of the disease at that period, there were numerous remedies offered, but none were effectual. And now, after years of patient study and experiment, when so much light has been thrown upon the nature of rust and its method of propagation, and when it is generally recognised that the solution of the problem lies in the breeding of wheats suited to our conditions and fitted by their constitution to offer resistance to the disease, even one-hundredth part of the sum originally offered by the States is not forthcoming for investigation in this promising field of research.

If this sum had been capitalised, and the interest applied for the endowment of research in this particular line, through the Rust-in-Wheat Conferences which met for a number of years, I venture to predict that there would have been a much greater advance in the production of rust-resisting wheats. To the credit of the Government of New South Wales be it mentioned that the epoch-making work for Australia of the late Mr. Farrer on the breeding of wheats suited to Australian conditions, received every encouragement at their hands; but this is a work in which all the States are interested, and from which important results are expected, and it is to be hoped that it will be continued with unabated vigour. In some of the American Experiment Stations plant-breeding is a recognised portion of the work, and why not here?

How these Aims are to be realised.

There is a wide diversity of soil and climate in Australia, and consequently in the nature of the products grown, so that each State of the Commonwealth has its own particular problems: but, on the other hand, there are great groups of diseases common to them all—such as the rusts and smuts of cereals—and on these grounds I would make a few practical suggestions. The field of plant pathology is seen to be a very large one, but it is practically confined in Australia, to the investigation of diseases caused by insects on the one hand, and fungi on the other. There are undoubtedly diseases requiring investigation, which do not strictly come under either of these two heads, such as the gouty or eel-worm disease of the onion, and the constitutional disease of the apple known as bitter pit; but, generally speaking, plant pathology here resolves itself into a study of insect pests and plant diseases due to fungi. The entomologist and the mycologist share the field between them, and it is only fair to state that their services to the agricultural, viticultural, and horticultural community, are becoming more and more appreciated. The time is not so far distant when the bug and beetle hunters were simply regarded as harmless lunatics, and the fungus maniac as something worse, if possible. But now, thanks to the great awakening which has taken, and is taking place in connection with agricultural education, they are coming to be regarded as useful and even necessary members of society.

In the various States the services of the official entomologist are in demand, because the insects, and their work of destruction, are too patent to escape notice. There is a Government Entomologist in Victoria, New South Wales, Queensland, Tasmania, and West Australia, while in South Australia the services of the Museum Entomologist are utilised. Their reports are widely circulated in the official journals of their respective Governments, and in many instances valuable handbooks are issued, which are much appreciated by the growers. But if we turn to the mycologist or the investigator of the fungus diseases of plants, there the case is different. This branch is only officially recognised at present in Victoria, as the Pathologist to the Agricultural Department of New South Wales, Dr. N. A. Cobb, resigned some time ago and went to Hawaii. The reason for this apathy is not far to seek. The diseases due to fungi are so subtle in their nature, and the results

produced are so evidently associated with certain states of the weather, that the common cry is, whenever there is an outbreak of rust or smut or take-all in the cereals, it is the *season;* and this cry has done more to hinder the progress of plant pathology in Australia, and to prevent encouragement being given to the investigation of such diseases, than all other causes combined—

> "A lie which is all a lie may be met and fought with outright,
> But a lie which is part a truth is a harder matter to fight."

The spores or germs of the fungus are certainly favoured or hindered in their development by the kind of weather prevailing at certain seasons of the year, but to say that the weather is the determining and only cause, is simply to confess that we are helpless and hopeless, as we cannot control the weather.

A recent case of rust in a flax crop in Victoria, well illustrates this point. Sixty acres grown from a particular kind of seed and sown in May, were completely ruined by rust, while alongside of that was an equal number of acres sown about the same time, of a different variety, and the crop was particularly clean and fine. But the most convincing portion of the field was that in which the drill had sown the two seeds mixed, and while the one set of plants were blackened and ruined, the other were healthy and clean. The season was evidently out of the question there, and in those cases where we can completely prevent the disease by appropriate treatment in spite of the weather, as in the black spot or scab of the apple, and leaf curl of the peach, the intelligent grower recognises that the cry of the weather has been used too much by the legislators in order to justify their own neglect.

In order to remedy this state of matters, there must be a more intelligent appreciation of the work among our legislators and producers, and a better knowledge of what is being done in other parts of the world, such as the United States, where there are at least fifty Experiment Stations where the subject may be studied. For present needs I would make the following practical suggestions.

1. That there be established a Central Laboratory for the study of diseases due to fungi, where the necessary equipment would be provided for investigating the nature and life-history of the organisms concerned in causing disease. The present time seems particularly favourable for carrying out this idea, as no individual State has gone to the expense of fitting up such a laboratory, and consequently there are no vested interests to consider.

The advantages of this arrangement are so evident that little need be said to support it. Many of our fungus diseases are common to the different States, and instead of each State wasting time, energy, and money, in more or less imperfect attempts, a thorough and continuous investigation could be made with all the necessary appliances for so doing. This view has not escaped attention, for it was brought forward in the Agricultural Bureau of South Australia many years ago, and in the pre-Federal days, I submitted a somewhat similar scheme to the then Minister of Agriculture, and to this he affixed the short and expressive memo.—"Pending Federation." But the study of disease, if it is to result in methods of treatment, should not be

confined to the laboratory. The progress of the disease must be followed on the farm or in the orchard, and its various developments traced, so that the measures recommended for overcoming it may be such as will commend themselves to those who are engaged in the business. There are many of these diseases which seriously affect important industries, such as grain rusts, fruit blights. and potato rots, and it is not always possible for an individual grower to undertake experiments for treatment. They make no experiments because they do not pay, and besides they are regarded as belonging to the duties of an Agricultural Department, being for the general welfare of the country, so that Experimental Stations become a necessity, and that is my next suggestion.

And here I might throw out the hint that a properly-equipped and well-officered Experiment Station, for the special purpose of breeding cereals and carrying out variety tests under scientific direction, is a desideratum for Australia; and if some of our wealthy citizens would found and endow such an institution, such a step would noc only exercise an important influence on the agriculture, and consequently on the development of the country, but it would form a lasting memorial to the far-seeing and patriotic donor.

2. That Experiment Stations are absolutely essential, where not only normal growth under suitable conditions can be studied, but where abnormal growth or diseases due to fungi and insects can be investigated.

Since the aim of plant pathology is not only to investigate disease and determine its cause but also to provide means whereby such diseases may be prevented or mitigated, practical experiments are always necessary. It is not altogether a laboratory study nor a field study, but a combination of both. It requires the exact laboratory methods for the microscopic examination not only of the parasite, but of the host-plant, as well as of the preparation of "pure cultures," and the experiment station, where the results obtained or suggested in the laboratory may be tested and applied in the field. And just as all the arguments for efficiency and convenience are in favour of a central laboratory, so are they all in favour of experiment stations in the different States. While experiments in connection with rust and smut and take-all in cereals, bitter pit in apples, mould in tobacco, &c., could be duplicated in the different States, where there are special crops grown, such as sugar-cane, bananas, or rice, arrangements could be made for carrying out local experiments with their respective diseases after the nature and life-history of the fungus had been studied in the laboratory.

3. That it is necessary to have men properly trained for the work in all the modern methods of pathological research, both in the laboratory and in the field, and to provide means for so doing.

The subject is really a branch of Agriculture, just as human pathology is of Medicine, and must be taught in a well-equipped Agricultural College. In such a college, the diseases of animals or veterinary science would be specially studied, as well as the diseases of plants or plant pathology.

In America, which has taken the lead in matters pertaining to plant pathology, Erwin F. Smith remarks that "at present and for some time to come the demand for well-trained plant pathologists is likely to be considerably in excess of the supply." And this is mainly owing to the fact that farmers and fruit-growers have realised that disease may be controlled, or at least mitigated, when its true nature is understood, and that it is necessary to produce the best possible crop free from disease at the lowest possible cost to meet increasing competition. He has also come to the conclusion that on account of the great and growing importance of the subject, a distinct chair of Plant Pathology will soon be established at some of our Universities.

Some Popular Fallacies concerning Plant Pathology.

By way of summing up, I may point out a few of the popular fallacies which still survive, in spite of all the evidence to the contrary, and it is hoped that the mere mention of them, in the light of what has already been said, may lead to views more in accordance with our present state of knowledge, or at least to an examination of the facts on which they are based.

1. That the weather is responsible for the disease where fungi are concerned.

This is shown to be a fallacy, from the fact that similar plants may be grown under exactly the same conditions, from different varieties of seed obtained from various sources, and yet the one will be free from disease, while the other is destroyed by it, as in the case of flax rust already mentioned.

Further, it is well-known to orchardists that apple-trees of the same variety and age in the same orchard can be treated for black spot, and the disease prevented, while trees alongside untreated will be badly affected, showing that we can control the disease, although not the weather.

2. That fungus diseases are so obscure, and so imperfectly understood, that no special training is required to diagnose them.

This is simply an apology for ignorance, since there are quite a number of diseases whose life-histories have been carefully studied, and their true nature clearly understood ; but because of this belief, often no provision is made by our legislators for making this knowledge available, and any self-constituted authority is regarded as quite capable of pronouncing a disease to be "fungoid," whatever that may mean.

3. That practical work in the field is alone necessary to understand and study disease.

This is only half a truth, and we sometimes hear the other half from the pseudo-scientific man, who maintains that technical knowledge and work in the laboratory is all that is required. Let it be clearly understood that a thorough knowledge of the diseases as they occur in the field is just as necessary as that acquired by the exact methods of the laboratory, and that a combination of both is required, in order to secure the best results as regards their proper treatment. The best practical knowledge available has

to be supplemented by the best scientific knowledge, and this is afforded by the Experiment Station, where practice and science go hand-in-hand.

4. That the plant itself is only a passive agent, and its surroundings, such as soil, manure, &c., are the main factors of health or disease.

It is at last beginning to dawn on the farmer and fruit-grower that the variety he plants, whether of wheat or fruit-tree, has an important bearing on the future growth, and that some varieties are more or less susceptible to disease, even the same variety may be more liable to disease at one age, or at one season than another. There is something in the nature of the plant itself which determines its behaviour under certain conditions, and this has to be investigated and understood, before we can devise methods for avoiding or controlling this liability to disease. It often involves breeding a new plant to suit the conditions, and this means an intimate knowledge of plant-life.

5. That certain diseases, such as rusts and smuts, affect plants indiscriminately.

There is a very widespread belief, based upon superficial observation, that all rusts for example, are very much alike, and that the same rust can attack all sorts and conditions of vegetation. Thus the late Dr. Schomburgh, of Adelaide, in giving evidence before a Commission on Cereal Diseases stated that "The red rust attacks generally only gramineous plants; but in the Botanic Garden it attacked also the roses." Now the rose rust is quite a distinct kind from the wheat rust, and the one is incapable of infecting the other. Farmers have often sent to me rust on the native flax, with the remark that as it could pass to the wheat, there was no hope of preventing rust in the latter; but I had to inform them that here again the rusts were quite distinct, and did not pass from one plant to the other. That the various rusts confine themselves to definite plants is strikingly shown in the wheat, oat, and barley rust. The spores from wheat will neither infect oats nor barley, nor those of oats infect wheat or barley, and the spores from barley will not infect wheat or oats as a general rule.

Old beliefs and superstitions die hard, and it is surprising how many of the old notions still persist, in spite of all that modern science has taught, and that well-planned experiments have shown to be fallacious.

Diseases of Fowls.

[Continued from page 39.]

G. BRADSHAW.

CHAPTER III.

Cholera.

IN most works treating with poultry diseases, the recognised methods have been to take them in alphabetical order, commencing with, perhaps, "anæmia" and concluding with "worms." The present papers will be a departure from the above rules, the order to be observed being that the most serious of the poultry yard diseases being taken first, the minor troubles following.

In the January *Gazette* roup was exhaustively dealt with, and described as the most destructive of all the ailments of domestic poultry, while the present subject, Cholera, without any clashing of terms, can be correctly described as the most fatal of all poultry diseases, epidemic or otherwise. The distinction between the most destructive and fatal being in the fact that while roup is responsible for more deaths than all other diseases combined, when taken in time a large percentage of the cases can be cured. Cholera, on the other hand, when once it gets into a large flock of poultry, attempts at curing are almost useless. The deaths, however, on the whole, are but a small percentage of the poultry of any country, from the fact that the epidemic is of but rare occurrence; but once the disease does get into a flock of poultry, the remedial measures are in the way of removing the unaffected birds to fresh ground, the destruction of the affected ones by fire or burial, and through disinfection, and a long time quarantining of the cholera infected yards.

J. Woodroffe Hill, F.R.C.V.S., says of the disease: "We have no direct evidence that the true Asiatic cholera has attacked fowl in England, but cholera, as it is generally understood, has more or less prevailed in certain seasons, and certainly, in many instances, has strongly simulated the Asiatic type. Fowl cholera is an epidemic diarrhœa, chiefly produced by defective régime, or hygiene, in the poultry yard, and the contaminating influences of choleraic discharges, decomposing animal and vegetable matters, impure water, and low, damp situations."

Cholera affects more or less all kinds of birds. Neither age or sex has any influence apparently in its production, frequency, or severity; but. according to French writers, birds in the best condition are earliest and most severely affected, and succumb quickest, as also the more matured ones. The mortality is greater in hot and stormy weather. Sudden cold has a decidedly checking influence.

There is no doubt that, independent of cholera, many evils are the offspring of negligence in paying due regard to the situation of the poultry run, as also to its foundation. Certain sites and grounds are as essential to the health of fowl as they are to other animals; and all inquiries into the nature, cause, and treatment of diseases can only end in but a very limited degree of success so long as individuals will persist in trying to rear birds in an unnatural manner, associated with a disregard to sanitation.

Again, often from want of a careful observance of the natural habits of a bird, but more especially through ignorance of the barest outlines of anatomical construction, simple functional disturbances are overlooked, and fatal diseases become established.

Fowl cholera is rapid in its invasion and course. If the symptoms are noticed early, the bird will be found dull and listless, rocking its body and dragging the legs (as though they were cramped) when walking. The feathers are ruffled and the wings drooped. The eyes are more or less sunken, the eyelids swollen, and frequently an irritable condition of the latter exists, causing the bird to scratch the parts. Appetite is suspended, but there is frequent thirst, and inclination for warmth is manifested by the affected birds huddling together, or keeping in the sun. Diarrhœa is present throughout, being at first glairy and mucous, and subsequently white and frothy, or bubbling. As the malady proceeds the depression is more marked; the eyelids are closed, the head carried low, and swollen from effusion of serum and congestion of the blood vessels. The gait is staggering, and the evacuations become very white, clearer, watery, streaked with blood, and offensive. The tail feathers, and also those about the vent, are wet and matted together. The mouth will be found full of dirty, sticky, or frothy matter, and the same is frequently seen to issue from the nostrils. The comb becomes flaccid and deepened in colour towards its border. All these symptoms continue to increase in severity as a fatal termination approaches. The bird is disinclined to move, and either stands with its back raised, the wings being away from the body and drooped, or squats on the ground with its beak in the earth and the wings spread out, the breathing is short and laboured, the crest swollen and black in colour, the vision almost lost, the plumage lustreless, and finally the bird dies in a state of stupor or convulsions.

With some birds shortly before death there are nervous movements, the respiration becomes laboured and convulsive and shakes the body; at intervals a harsh, guttural cry is emitted—a kind of hiccough. At the same time the feet and wings are agitated and contorted, a little foamy saliva flows from the beak, a small quantity of white or greyish bubbling fluid is expelled from the anus, and the bird perishes. In other cases there appears to be no convulsions, and it is not rare to find them dead on the nest without a straw having been disturbed. Others before death turn round as if attacked with vertigo. In some there is a kind of vomiting of a glairy, yellowish-white fluid; and the diarrhoea, which is nearly always present, is either grey, white, yellow, or black in colour, or streaked with blood. The duration of cholera may vary from a few hours to two or three days.

Post-mortem Appearances.—The body externally is usually of a purplish tint, with the exception of the crop and abdomen, over which the colour is of an inky green, while internally lesions peculiar to this disease are always apparent. On examination of the birds forwarded to me the following striking phenomena of cholera were noted: Lining membrane of the mouth livid, except towards the outside which was pale; throat purple and full of sticky, dirty-yellowish matter; tip of tongue hardened and partly detached; eyes sunk deep into the sockets, eyelids swollen; gizzard empty, except a little gravel and thin acid fluid; muscular substance of a deep red colour; intestines extensively inflamed with extravasated blood patches under the mucous membrane and here and there corrosions. The matter contained in the intestines was of a dirty, thin, acrid nature; liver deeply congested and increased in volume; lungs slightly congested; heart purplish red and blood spots. The pericardium contained an excessive amount of straw-coloured fluid.

Mr. Edward Brown, F.L.S., another English authority, writes:—"One of the most dreaded of all diseases to which fowls are subject is that known as fowl cholera, and it does not appear that any country is free from it. So serious has its ravages been upon the continent of Europe that such great scientists as Koch and Pasteur have given a considerable amount of attention to it. In America it has been at various times epidemic, while occasionally in the United Kingdom it has swept off vast numbers of poultry, and recently it was very prevalent in several districts of Ireland, where the wretched fowls kept and the conditions under which they live make them specially favourable subjects to it. Fowls affected with cholera speedily succumb, showing all the symptoms of high fever and rapid emaciation."

The causes of this dreadful disease are many and various and there can be no question that it is terribly contagious, the epidemic spreading like wildfire when once it has been admitted into a stock of poultry, and the chances of stopping it are very few indeed. We have known it introduced by the purchase of a fowl suffering from cholera. But the important thing for every poultry keeper to remember is that even cholera is powerless if the birds are perfectly healthy. The causes which may be said to engender chicken cholera are foul water, rotten food, fetid earth, and impure air in fact—those conditions which always engender disease of one form or another. Its greatest ravages have been among very highly-bred and highly-fed exhibition poultry, and the poor, in-bred, miserable fowls which are to be found in Ireland. Some French writers seem to think that the healthiest birds go off first, but we do not think that this opinion is borne out by the facts of the case.

Another English writer says:—"The symptoms of cholera cannot as a general rule be observed in the earliest stages or soon enough for any treatment to be of avail to the actual victims. The period is so brief and the disease develops so rapidly, that the bird often dies before any restorative means of cure can properly act. Perhaps the most constant and prominent symptom is the profuse diarrhœa, at first of a yellowish green colour, and becoming thinner and greener as the disease advances; so it would be as well whenever much looseness of the bowels is exhibited by a number of fowls, or when several die

suddenly, to isolate the birds without delay. But there are other symptoms: such as great and general weakness of the body, a sleepy and mopping mood, livid discolouration of the comb and wattles, drooping of the wings and ruffling of the plumage, stiffness of the joints, fever and constant thirst, and loss of appetite. Towards the end (cholera runs its course and ends in death in from twenty-four to thirty-six or forty-eight hours), the victim breathes heavily and quickly, its crop fills with mucous and wind, the food is not digested, the eyes close, and in a short space of time the bird's existence is over, death resulting apparently from paralysis of the heart or lungs, caused by the poisoned blood. Among the predisposing causes are overcrowding and impure air in the roosting house, bad food and water, filthy quarters and foul soil. But as cholera has broken out in flocks where the management has been good, the poultry-keeper should look rather to situation and climate as the primary causes. It has been observed that low, damp places are more conducive to cholera than those that are high and dry; and during hot, stormy seasons the disease plays most havoc, and spreads at an alarming rate."

Treatment.

Despite the fact that the above authorities are unanimous in the conclusions that treatment is of little avail, they admit that if cholera can be detected in the early stage some cures may be effected; the following treatment being that suggested by the authorities quoted.

It is well known that M. Pasteur introduced the practice of inoculation as a preventive against cholera, but his method is somewhat complicated to be grasped by the lay mind. Moreover, the expense of the operation may be considered too great when dealing with creatures of such small value as fowls; and, again, before the disease has been correctly diagnosed, it has often made such headway that the majority of the fowls on the premises are either dead or infected. If, however, the poultry-keeper can deal immediately with the disease, the following treatment is recommended. Take 25 grains of pulverised camphor, 30 grains of cayenne pepper, 48 grains of pulverised rhubarb, and 60 drops of laudanum; mix all together, and make it into eighteen pills, giving each sick bird one pill every three hours.

For their thirst they should be given scalded sour milk to drink, or alum-water. Should time permit, this would be found to act efficaciously, and the evacuations will soon resume their normal appearance. The sick fowls should, of course, be isolated. Despite the methods mentioned, many authorities are of opinion that the most profitable course to pursue when an outbreak of cholera occurs is to kill and burn all ailing fowls, and, if possible, to remove the survivors to entirely fresh quarters (a gravelly soil is the best), thoroughly cleansing and disinfecting the old ones. Provided the weather is not too severe, the birds are best kept entirely in the open, and care should be observed to keep their food and drinking vessels perfectly clean, for the disease is easily spread by food or water soiled by the excrement of the affected birds.

Mr. Woodroffe Hill's treatment is as follows:—"With regard to cholera, very little, unfortunately, can be said in favour of curative measures. Just

as in other acute and rapidly-developed diseases, to be successful it must be treated early. With poultry, common salt has been found beneficial. Epsom salts, in the premonitory stage, given sparingly, would be more applicable. Anti-acids, especially chlorate of potash, are useful in the more advanced stage; and in profuse purging, chlorodyne and carbolic acid are the most efficacious agents; 3 to 6 minims of the former in a dessert-spoonful of water, and 1 minim of the latter pure, dissolved in 10 drops of glycerine, and given in a dessert-spoonful of water. Strengthening food should be supplied; also fresh water. In dealing with the subject sanitarily, complete isolation of the diseased birds should be made; cleanliness, protection from the sun, change of food, good water, removal of locality, especially in the case of young birds, are all matters of importance; while dead birds should be thoroughly and safely disposed of, and disinfection practised, as far as compatible with the circumstances. Where the runs are enclosed, the ground may, with advantage, be well watered with a solution of any recognised antiseptic."

Mr. Edward Brown recommends the following treatment:—The only really efficacious medicine is chlorodyne and carbolic acid, and upon these we should almost entirely depend; but it is right to say that the chances of cure are few and far between, and very seldom can a cure be effected—so seldom, that it is best at the very first appearance of the disease, to ruthlessly use the knife. The appearance of chicken cholera should be taken as a sign that the methods of feeding or management are wrong, and attention will need to be given towards prevention of its spreading.

The above are all English authorities. The experiences, investigations, opinions, and suggested treatment being applicable to that country, the climatic and other conditions being so unsimilar to Australia, that the various recommendations might be more or less effective here, and fearing this, influenced me in looking for a country whose meteorological conditions were similar to those obtaining here, and find out to what extent cholera obtained there, and the methods adopted for combating its ravages.

America is a country embracing all the temperatures, and the State of California not only more nearly approaches the conditions here; but also that cholera has been prevalent, and more fortunate still, the Agricultural Experimental Station, attached to the University of that State, has made exhaustive investigations on poultry diseases, including cholera. The investigations were made by Mr. Archibald Ward, Veterinary Bacteriologist, the following being a condensed report of his bulletin on the subject:—

"Fowl cholera is a most dreaded disease. One instance is reported of its ravages among a flock of 5,000 fowls with such destructive results that the owner sold out the few hundred survivors, and moved to another locality. In October, 1903, opportunity was afforded to make observations in a community extensively infected with fowl cholera. The owner of a ranch stocked with three thousand fowls reported the outbreak of cholera among his flock, and solicited advice concerning the control of the disease. A survey of the situation revealed a deplorable lack of sanitary precautions. The dead fowls were not gathered up promptly, with the result that many of them were

partially consumed by the survivors. This fact alone would account for the rapid spread of the infection among fowls closely associated together.

There was opportunity for the contamination of food by the droppings and for the pollution of the drinking-water fountains by the thirsty sick. The colony system, fortunately in practice, had restricted the pestilence to the colony originally infected and to three others situated a few hundred feet away. Strict sanitary measures were suggested and carried out by the writer, assisted by Mr. H. O. Woodworth, foreman of the California Poultry Experiment Station. The infected colonies were moved, to more thoroughly isolate them from the other colonies. Particular care was exercised in collecting the dead from under the roosts early in the morning and in slaughtering all sick fowls. Daily spraying of all poultry houses with a disinfectant was practised. Later, the drinking water was eliminated from the list of possible means for the transmission of infection, by adding corrosive sublimate to make a solution of one part to two thousand parts of water.

The death rate of forty-eight, on the day before operations commenced, dropped in five days to ten a day. After two weeks the daily death rate dropped to four, and steadily diminished until the experimental work was discontinued two weeks later. The infection remained restricted to the five colonies where the disease originally gained its foothold. The failure of the owner to appreciate the necessity for continuing sanitary measures resulted in extensive losses during the six winter months following.

The neighbourhood furnished examples of the unnecessary spread of infection by means readily preventable. These were practically all due to careless disposal of the dead, or to incomplete isolation of infected colonies. Conversation with the owners, and an inspection of the methods in practice, gave the impression that they appreciated the importance of sanitation, to a certain extent. Disinfection was practised quite generally, but at such rare intervals as to fall far short of accomplishing the best results. The plea that the available labour is unreliable and not to be depended upon to do the work thoroughly, seems to be well founded upon fact.

Two minor outbreaks of fowl cholera have been observed in other localities. Bacteriological examinations definitely established the character of the disease in each case, as in the first. In one flock of about fifty fowls in Oakland, ten were lost. Vigorous sanitary measures prevented the future loss of fowls other than those infected when the measures were put into operation. The source from which the flock became infected could not be determined.

Recently a centre of infection has been discovered in Alameda. Among one hundred fowls, about a dozen have died at frequent intervals for several months past. The sanitary conditions were excellent, which accounts for the slow progress of the disease. The fowls had been purchased six months before from a dealer who had gathered them up from a large number of flocks.

While fowl cholera is commonly understood to be widely prevalent in America, very few opportunities have been afforded to make a conclusive diagnosis. In 1880, Dr. Salmon studied a disease that displayed

the symptoms and pathological changes of the European fowl cholera, excepting in a few minor particulars, shortly afterwards issuing the following.—"The treatment of such a disease as cholera, running so rapid a course, and with such violence, must be prompt and active. To wait a few days to see whether any more birds take the trouble, is giving yourself a hard, discouraging season in which to get rid of the last case. The man who is quick to see any change in the appearance of his hens, will early note danger in the first few hours of cholera. At the first suggestion of a possible cholera case, quarantine all doubtful birds; at once scald or break every drinking dish, scald all food utensils, and clean up every house. In other words, destroy every lurking germ that can cause future trouble. If the sick birds can be kept by themselves so much the better. Add to each quart of drinking water for the sick birds, spirits of camphor one teaspoonful, and one-fourth ounce of sulpho-carbolate of zinc. The sulpho-carbolate of zinc should be white in colour; the more red it shows the more impure and irritating it is. For drinking water for the apparently well birds, add to every quart, one-eighth ounce sulpho-carbolate of zinc. If the diarrhœa is excessive give a pill of "Dover's Powder," one grain every two hours until the discharge lessens. The opium in the pill relieves pain and quiets the muscular action of the bowels. The diet question is difficult to solve. Anything bulky is out of the question, if indeed the bird does not directly solve this by refusing to eat at all. Highly concentrated food is needed to sustain life, something easily digested, and this requirement is best found in meat juice. One tablespoonful every four hours, given by means of a spoon or glass dropping tube, will help the case. The meat juice is prepared by half cooking steak, squeezing the liquid out, and adding a little salt and pepper. The treatment of cholera is not satisfactory in results. If you succeed in curing more than one-half of your birds, you may well doubt the presence of that disease, and conclude that the trouble is simple diarrhœa, enteritis or indigestion.

"The successful plan of handling cholera is prevention, rather than the time and labour needed to doctor sick birds."

Speaking generally, poultry-men in Australia have had very little experience of cholera. There have been two notable disastrous outbreaks of disease within the past twenty years; one on a fowl farm, and the other confined to ducks. In both instances the conditions were such as the various writers affirm cause cholera, and whatever the owners thought, there is no doubt that all evidence pointed to this disease, and in the instance of the fowls, the owner adopted the suggested measures of removing the healthy stock, destroying the diseased ones, and wisely vacated the infected farm.

Every poultry-keeper has had experience at times of one or several cases of mysteriously sudden diarrhœa, not infrequently attributing such to cholera. This is not the case, other causes being responsible for the trouble, and with our magnificent climate, no overcrowding, and good sanitary conditions, there is every hope that, as in the past, this most fatal disease may be but rarely experienced by poultry-men of Australia.

[*To be continued.*]

The Buckscraper.

A Useful Implement in Farm, Orchard, and other Work.

W. J. ALLEN.

I HAVE been struck in the course of my visits to many parts of the State by the absence of good scoops for levelling land for orchard and other purposes, and I have had many inquiries as to where such an implement could be obtained. The several sketches which I herewith give will serve to illustrate such a scoop, or buckscraper, as it is usually called, and is the implement mostly in use in parts of California and Victoria where large tracts of land have had to be levelled for orchard purposes, lucerne, &c. It has also been found useful for grading roads and making channels and earthen fills; it is most handy for making and cleaning out stock-tanks; in fact, it is claimed to be the best scoop for general use by all who have ever used it. Any blacksmith can easily make the necessary ironwork, and the woodwork can be put together by any handy man. The buckscraper, as we shall call it, may be made in two sizes; the smaller size 4 feet long, for two horses, and the larger size 7 feet long, for four horses.

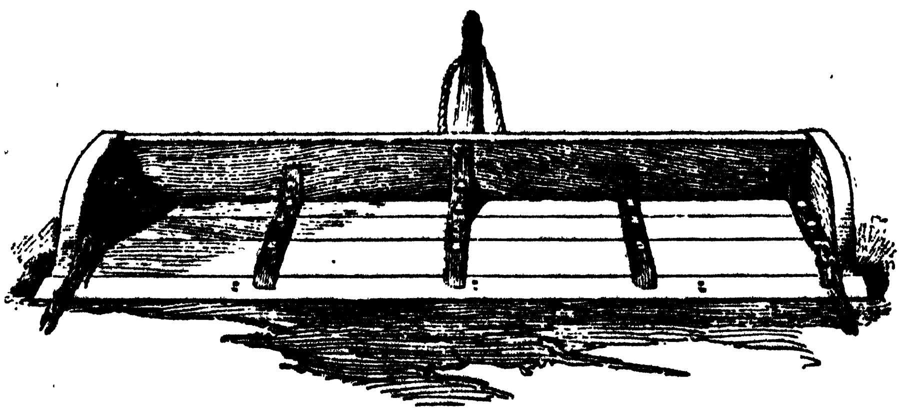


Fig. 1.

Figure No. 1 illustrates the inside of the scoop before being filled, showing the handle at the back, and the two chains, one at either end, by which it is drawn; the larger size having two horses hitched to each chain, and the smaller only one horse to each chain. The chains by which the buckscraper is drawn are 2 feet 9 inches long, with a large ring at the end for convenience in hooking on the swings.

Figure No. 2 shows the bottom and end of the buckscraper, and gives a fair idea as to how the implement is constructed. There are two runners, or rockers, which serve to carry the weight when the scoop is filled. These are

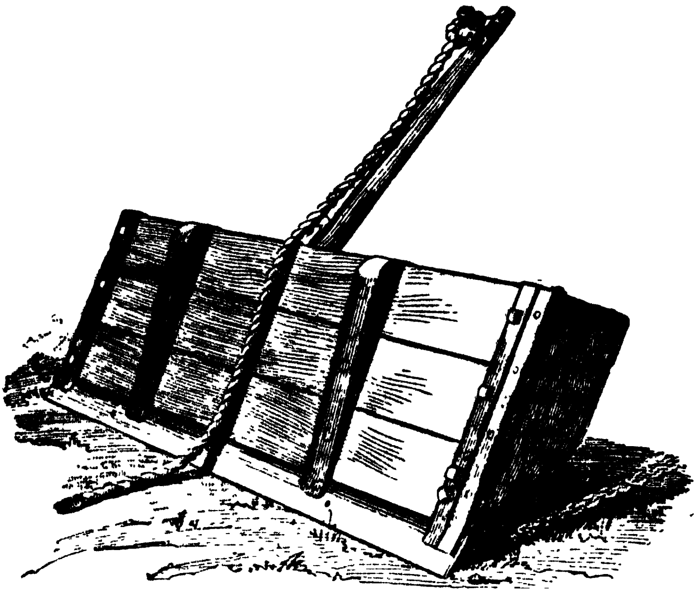


Fig. 2.

shod with steel. When empty, it is usually drawn along (as shown in figure No. 2) until ready to fill, the ends acting as runners. These also are shod, to prevent the woodwork from wearing out. There is a 3-inch rope attached to the end of the handle ; this is for convenience in bringing the buckscraper into position for filling. The driver, by placing his foot on the blade—which, when the scoop is in No. 2 position, is touching the ground at the back—and giving the rope a sharp pull, will easily bring it into position for filling. For the purpose of dumping out the earth, he raises the handle gradually while the

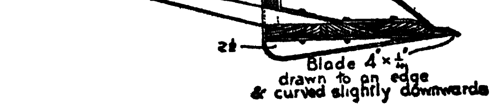


Fig. 3.

horses are moving, the earth emptying itself slowly and being evenly distributed over the surface of the ground, instead of being dumped in a heap, as is ordinarily the case with scoops. This is a great help in doing fine work, such

as the final levelling of the land for orchard or lucerne, where it is necessary to have a perfect grade for irrigating, or for roads, fills, &c. The driver will probably take a day or two to become used to the implement, but when he does so he will not change it for any other, as earth is quickly and cheaply removed by it.

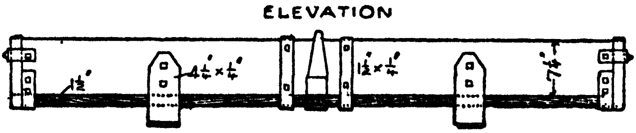


Fig. 4.

The proper yoking of the team is a most important consideration. In the small buckscrapers designed for two horses the swingle-bars are attached, as shown in figure 6. Each horse is attached to a single swingle-bar, and is free to move without reference to the other horse, except for the coupling-strap, about 2 feet long, connecting the horses at the hames. With four horses, they are yoked abreast, but each pair is attached separately to the draw-chains by means of an ordinary set of two-horse swingle-bars (see figure 7). The four horses are connected at the hames to prevent them see-sawing; it also saves the driver, and enables him to control the team better,

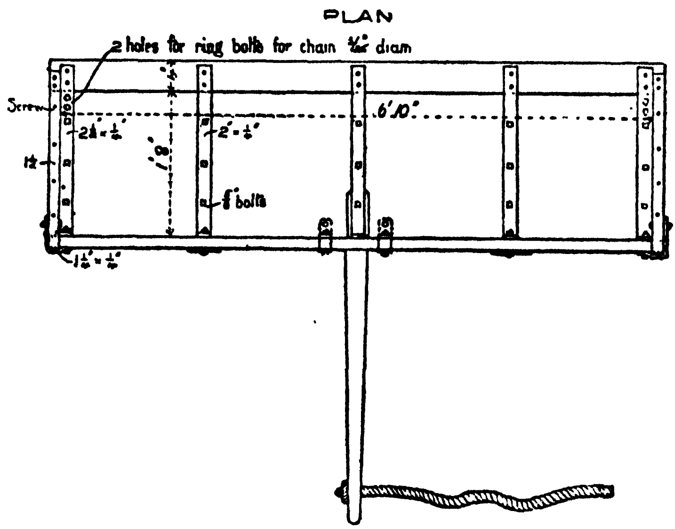


Fig. 5.

if the horses are also connected at the bits by a strap or short length of rope; these are better fitted with proper snap-hooks that are quickly undone. One man performs the whole operation of driving and working the scoop. By using leather reins, of a proper length, driving and turning is easily done. By

holding the reins with the hand, and using the upper portion of the arm as a lever, a team of four horses can be turned in an instant, and much better work done than is possible where one man drives and the other works the scoop.

It is strongly advised that leather traces be used, as little trouble from chafing will occur, notwithstanding the great amount of turning and the narrowness of the swingle-bars; but if chains are used, they should be covered with basil or bagging. In yoking-up, do not have the traces longer than is necessary for the team to walk without hitting the bars. Use back-bands, and let the team learn to get back in their places themselves when they get a leg over the traces. They soon learn, and it saves a great deal of time. The buckscraper when full of earth should ride on the runners without digging into the ground, and when empty should be light on the hand, so that little heavy lifting has to be done by the operator. A properly-balanced buckscraper depends on the position of the eye-bolt attachments for the draw-chains and the way the team is yoked-up.

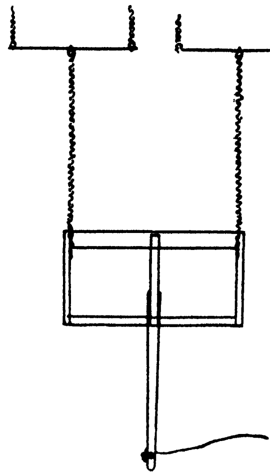


Fig. 6.

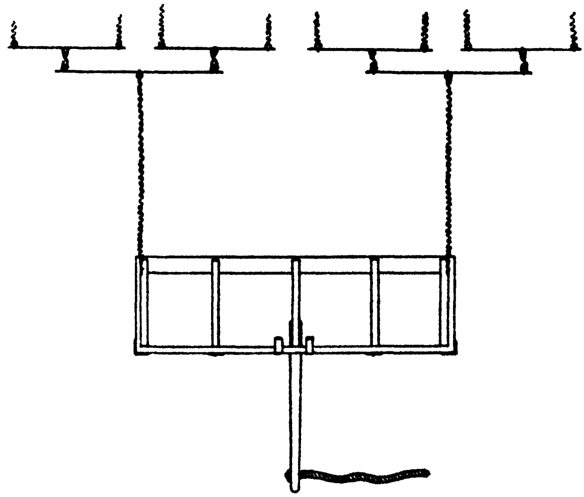


Fig. 7.

Very slight alterations in these particulars may make all the difference between a clumsy machine and one that is easy to work.

Viticultural Notes.

M. BLUNNO.

The Use of False Heads in Fermenting Vats.

It was suggested in a pamphlet issued by the Department some years ago to use wire-netting of $\frac{3}{4}$ inch mesh as a false head to keep down the cap during fermentation. This has led to some inquiries on the subject as to whether galvanized or copper wire netting should be used; but this is really a minor point, as chemically both are not objectionable. The main issue is whether a false head is at all necessary.

The cap made by the husks can be easily broken and rammed down twice a day, and this operation, if well done, answers as well as the application of false heads. It also has the advantage that the temperature can be controlled better. The vigneron must follow the rises of temperature by placing the bulb of a thermometer just under the cap where it is highest; if false heads are used, this is not easily done. By ramming the cap down, the top layers (always hotter) are mixed with the bottom layers (always cooler), and if false heads are applied, the breaking and ramming down of the cap is no longer possible.

Whether false heads are used or not, the must should be drawn from the bottom of the vat and pumped over the top, distributing the liquid evenly over the surface, and thoroughly mixing it.

How to prepare Unfermented Grape-juice.

Under the climatic influences of this State, grape-juice very soon sets up alcoholic fermentation, which is to be guarded against by every means possible if unfermented wine is to be made.

It will, therefore, be necessary to instal a proper pasteuriser and filter, whereby not only the yeast and other micro-organisms contained in it are promptly destroyed, but which will also prevent the inquination of harmful moulds from the atmosphere, and from tools and vessels employed in the manufacture. A filter working under pressure is indispensable, although other appliances may be done without.

The grape-juice should, in the first instance, be subjected to a temperature of 135° Fahr. for about twenty minutes. In the absence of a proper pasteuriser, the same result may be attained by passing steam through a coil placed in the must or by heating it in a steam or water jacketed boiler. The first heating will have the effect of killing the yeast germs and render inactive those distributed through the mass, where, by any fault of the arrangement, the proper temperature is not reached. Germs of mould and of other alterations are also rendered temporarily

inactive. This done, a filter working under pressure is required. All such filters contain a cellulose paste, which is placed in different positions according to the make; these filters are of European design and manufacture. It is useless trying to filter must through paper or cloth. It is too thick, and contains too much slimy matter; besides, pressure is required for any filter if the operation is to be effective.

If only a small quantity is to be made, a filter—which is a rather expensive machine, and can only be obtained from Europe—may be dispensed with, by proceeding as follows:—After having given the must the first heating, as explained above, 4 to 6 oz. of potassium metabisulphite should be placed to every hogshead (65 gallons) of must. This is a white crystalline substance, and is sold by wholesale chemists at 2s. 6d. per lb. It should be dissolved in about a pint of hot water and then mixed with the must. It will help to check fermentation for a little while, thus giving time to finish pasteurising the juice. The filtering may be done through one of those of conical shape made of woollen cloth, such as are used in cordial factories. To expedite the operation of filtering, tannic acid is also mixed with the must in the proportion of 1 oz. to every hogshead. The addition of the tannic acid will have the effect also of clearing the liquid very much, and after standing absolutely still for twenty-four hours, a heavy sediment will collect at the bottom of the vessel; the cleared liquid is then gently decanted off. When using new woollen filters, it is a good plan to steep them in an alkaline solution made by mixing 2½ lb. of commercial caustic soda in 5 gallons of water, and wringing them out once or twice. Finally, they are well rinsed in fresh water three or four times. If this is done no unpleasant taste will be imparted to the must by the new cloth.

The filtering done, the must is again heated, but this time to a temperature of 165° Fahr. to 170° Fahr. for another twenty minutes; care should be taken that the whole liquid is uniformly heated. The liquid is then allowed to cool. The surface should be thoroughly protected from dust. It is then ready for bottling.

Naturally, no matter how great the care exercised in bottling the grape-juice after the pasteurising, germs of mould and yeast floating in the air will inquinate it again, and slowly set the bottled liquid in fermentation, or become the cause of a gradual alteration.

To avoid this, it is much better to bottle the grape-juice as it runs from the filter, cork the bottles and fasten the corks, and then put a number of bottles in a large tub full of water, keeping the level of the water up to their neck.

The bottles stand upright on a false bottom placed in the tub. Between the bottom and the false bottom a steam coil is fixed for the heating of the water. The water is gradually heated to prevent breakage, and to the same effect a small air-chamber is left between the cork and the level of the liquid.

The bottles should be thoroughly cleaned by first using a solution of 5 per cent. caustic soda, followed by one of sulphuric acid of about the same strength, and rinsed several times with very clean water. If the water is not of the purest description, then 4 oz. of potassium metabisulphite should be dissolved in 20 gallons of water, and the bottles finally rinsed in this. The corks will have to be boiled for at least fifteen minutes before being used.

Mr. Leo Büring, manager of the Minchinbury Vineyard, Rooty Hill, is the agent for a very good filter for the above purpose. It is of German manufacture. Some very good unfermented grape-juice was made by Mr. Büring last vintage.

Grey Rot due to Sun-scalding.

Some bunches of grapes have been received, suffering from a kind of grey rot. It was thought by the grower who forwarded them that they were suffering from a disease; this, fortunately, is not the case. Every year I see a few grapes similarly affected. Table grapes seem to suffer more than the wine-making varieties.

The reason for such trouble is due to the excessive heat (the sample came from near Inverell), which disorganises the epidermis (skin) of the berries. Bunches that are well protected by the foliage are sometimes suddenly exposed to the sun, caused by the cultivating implements disturbing the leaves.

The sudden exposure to the intense heat kills the tissues forming the skin, and naturally the pulp becomes flabby and rots away gradually.

It begins by first showing a fairly large grey spot; then the skin sinks in, and by degrees the whole of the berry is affected.

Grapes for Identification.

The same grower also forwarded some bunches of grapes for identification; but, unfortunately, they were not in a condition that would allow of any definite statement as to their variety being made.

In forwarding grapes for identification, a few leaves and a small piece of the cane should also be sent. It is also advisable that the grapes be ripe.

The following questions have been submitted for reply, as they are of general interest to many wine-growers. The whole are reproduced here:—

1. How is good wine made from Black Spanish and Hermitage grapes?

Mixing two-thirds of Hermitage and one-third Black Spanish grapes will make a good wine.

2. Which is preferable: a deep or shallow vat for fermenting wine?

If the quantity of must can be divided into lots of from 200 to 300 gallons, then a vessel that is deeper than it is wide is to be preferred. For larger quantities, a fermenting vat that is not so deep is better, because it allows the top and bottom layers of must to be mixed by ramming down the husks twice a day.

3. How long does wine generally take to ferment?

The time taken by a must to ferment out all the grape-sugar and become a dry wine varies principally with the quantity of the grape-sugar itself, and with the temperature of the juice. If the juice is very cool, it may take from five to six days; if it is very hot, it will take from two to three days; but in the latter case the wine is subject to turn out badly.

4. What is the best temperature to have in the cellar?

If it is meant the best temperature for a fermenting house, 60° to 65° Fahr. is good; different parts of the cellar require different temperatures, although, owing to the way cellars are built in Australia, in very few is such a condition found. However, during vintage, it is not so much the temperature of the fermenting house as it is that of the grapes at the moment when they are crushed and put in the vat that matter principally. It will be found that grapes which are crushed when cool make better wine than is the case when the grapes are picked when hot and then crushed. Where there is only a small vintage, it may be possible to pick them early before the heat of the day, and crush them straight away, in which case the grapes will be in the best condition for crushing, and the must will be cool.

Where from the extent of the vintage picking must be carried on during the hottest hours of the day, it is advisable to cool them by spreading them out on a floor or tarpaulin, being careful not to crush any, and leaving them all night to cool, and crushing first thing in the morning.

Never crush grapes when hot, or in nine cases out of ten the wine will be spoilt.

5. Is it necessary or better to fortify wine? If so, how much spirit should be added?

Dry wines of the claret and hock types should not be fortified with spirit; in fact, the Wine Adulteration Act, administered by this Department, forbids the fortification of dry wines. Sweet wines may be fortified.

For detailed instructions regarding the fortifying of sweet wines, reference should be made to my article on the subject in *Gazette* for March, 1897, or to pamphlet No. 147, which may be obtained on application to the Director of Agriculture.

6. What is the best method of cleaning casks that have been lying empty for about five years?

To thoroughly clean a cask that has been lying empty for so long may prove a difficult task. Moulds of various kinds harmful to wine may have affected the inside surface and rooted deeply into the staves. A good plan

is to pull the cask to pieces and plane the inside surface of the staves and heads; then put up again and treat the cask with a 5 per cent. solution of caustic soda—that is, 5 lb. caustic soda to 10 gallons of water. The caustic solution should be in contact with every part of the cask for at least twenty-four hours. To effect this, about 20 gallons would be required for a 200-gallon cask. The cask is rolled every twenty-four hours to bring a fresh part of the cask in contact with the solution, then stood on one end and then on the other for twenty-four hours.

Following on the soda-wash, a solution of 5 per cent. sulphuric acid—which is prepared by mixing 5 lb. commercial sulphuric acid with 10 gallons of water—should be used in the same manner as the soda, and finally the cask should be thoroughly rinsed with fresh water.

The above solutions are made by adding the chemicals to the water in a separate vessel. Do not add water to the sulphuric acid on any account, or it may spurt and cause painful burns.

It is not an economical proceeding buying casks that have been neglected. Wine is so easily tainted. It is better economy to purchase good, sound casks in the first instance.

WHEAT TESTS AND FLOUR ANALYSES.

IN connection with the tests of wheat and analyses of flour made by the Chemist of the Department of Agriculture, the Honourable the Minister for Mines and Agriculture (Mr. S. W. Moore) has decided:—

(1.) That in all cases where the report is required for purely commercial purposes (other than for export), and provided Ministerial approval is obtained for furnishing such report, a charge of £1 1s. will be made.

(2.) In all cases where the report is required for export purposes the fee will be 10s. 6d.

(3.) In cases where the farmer or miller requires the information solely for his own use, and for the purpose of obtaining an idea of the milling characteristics of his wheat, or the nature of the flour produced, the test or analysis will be made free of charge.

Butter Classification.

The Scientific Examination of Butter for Export to England.

M. A. O'CALLAGHAN.

NUMBERS of men can be relied on to judge butter and say which is the best sample for ordinary use, to be consumed within a few days after manufacture; but it is a difficult matter to get judges who can, by the aid of their eyes, their nose, and their palate, select from a number of samples those that will and those that will not deteriorate materially during the journey from Australia to England. The question arises, have we not reached the stage when these general and very old methods of arriving at conclusions regarding the quality of butter for export to distant countries should not be solely depended on? We now know the cause of butter decomposition; we know that, given certain conditions, butter will soon become deteriorated by the action of micro-organisms; we know a number of the varieties of these organisms that cause certain defects in butter, and it seems only a natural sequence that we would examine all export butters, of apparent good quality, to see if they contain germs known to injuriously affect the quality of the butter under the usual conditions of storage here, storage on board the ships, and storage in England before the butter passes into consumption. About eight years ago I did a considerable amount of investigation of this character, and I found that, given an intimate knowledge of the action of those varieties of micro-organisms common to butter, it was possible to form, in conjunction with the usual butter examination, a very sound judgment as to whether the butter would be of good quality when offered for sale in England.

Fishy Butter.

The terror of the Australian butter-grader is the form of decomposition which is accompanied with a fishy flavour. He knows that if the butter is only a couple of days old, and has been well cooled after manufacture, it may have an excellent flavour, and still harbour germs that will, as soon as opportunity offers, develop rapidly, and convey to the butter that peculiar oily fishy aftertaste and flavour so much disliked by all consumers. If the necessary germs are present, and the farmer sends his cream but every second day to the factory, then the butter will be fishy soon after it has been made, before the temperature of the butter can be lowered sufficiently to prevent the germs from growing. This butter has no terrors for the trained grader, because the fermentation has proceeded sufficiently for him to discern the fishiness. It is the cream that

comes daily to the factory, quite sweet, but yet contaminated with the spores of *oïdium lactis*, that shelters trouble for the cream-grader in the first instance, and for the butter-grader later on. If the factory manager cools his cream and his butter properly, the work of the micro-organisms will proceed but very slowly, and sufficient of the substance which gives the fishy flavour will not have been formed to enable the grader in Australia to class the butter as second quality. If the freezing is well and rapidly done, and if the butter is carried on board the steamers below 20° F., it may pass muster on arrival in London. Then, if the market is buoyant, the butter will go into consumption rapidly, and may be eaten before the micro-organisms have had suitable time and temperature to perform their undesirable functions.

Delays in Transit.

Sometimes, however, our coastal boats get bar-bound, and then the butter is perhaps held for four or five days at a temperature above 50° F., with the result that the butter which harboured the micro-organisms to which fishiness is due, arrives in Sydney in an advanced stage of fishiness. A couple of weeks ago more than 1,000 boxes of butter were affected in this way. One of my grading officers sent a telephone message, saying he wished me to come down and look at a parcel of fish. The parcel of fish turned out to be a line of 200 boxes of butter, and on proceeding to the other grading store I found 300 boxes from the same district similarly affected. The interesting feature of this case was that, from bacteriological investigation in the laboratory, I had known for a couple of weeks previous, and in fact had warned the factory and the graders, that the butter from the factory in question had contained, for some weeks previous, the organism of fishiness, and that only favourable conditions were necessary for the article to turn out fishy. I have since had news from London that some of these earlier lots had proved fishy on arrival in England, though the graders, at the time of shipment, were unable to detect anything in the way of fishiness. I examined these butters myself, and had no suspicion that they would go fishy; but immediately I saw the result of the bacteriological analysis, I knew that if the temperature of the butter on board the steamer was not down to 20° F., or if the butter was held for a few days in any ordinary store in England before its final sale, it would be certain to be fishy before the consumer had used it.

Every butter that passes into Superfine quality with the graders is regularly examined bacteriologically, because I want to be certain that no butter shall leave New South Wales branded "Superfine" which shall prove fishy on its arrival in England. If it escapes one week, before the result of the examination is known, it is marked for early examination the next week. In no case has a butter been reported on as fishy on its arrival in London, but on turning up our bacteriological records,

it is seen that the butter from this factory has been marked as containing numerous colonies of the little organism *oidium lactis*, which it is now proved, beyond doubt, is at least the chief cause of fishiness in Australian butter.

Unsalted Fishy Butter.

Some factory managers and others have been in the habit of attributing fishiness in some way to salt. This theory has been knocked out since we began to export unsalted butter in quantity. Many consignments of unsalted butter have turned out fishy in London, and if any further evidence was wanted, it was furnished by the delay of the coastal boat above referred to. On this occasion, the factory that suffered most had both unsalted and salted butter on board, and the worst of the lot was a line of unsalted butter. It may have been the oldest, but it was too fishy to be of any use for first-class table butter.

In the illustrations given herewith are seen photographs of plates representing various butters that have turned out fishy. All contain the mould *oidium lactis*, the organism that, when grown in conjunction with bacillus *acidi lactici* in cream, I have found to produce fishiness on every occasion.

Description of Plates.

Illustration No. 1 is a photograph of a gelatine plate culture from a sample of butter, and shows eleven well-developed colonies of *oidium lactis*. The other micro-organisms appearing in the plate are of no importance from a butter fermentation point of view. This, as well as all the other butters, was submitted for export, and hence underwent inspection. The inspector's remarks on this case were: "Butter lacks body, and is of a fishy flavour." The total number of points awarded to it were 78, which brought it low down in second-class.

This represents a case of where the butter was made from cream which was not delivered regularly at the factory, and in which the fishy fermentation had proceeded to a considerable extent before the cream was treated for butter manufacture.

Illustration No. 2 represents another second-quality butter, to which the grader gave 82 points out of 100. He made no remarks with his certificate, but submitted a sample for bacteriological examination, the result being that the plate showed seven colonies of *oïdium lactis*, with no liquefying bacteria.

Illustration No. 3 represents a butter that just got into the lowest form of first quality, viz., with 87 points. The grader's remarks on this occasion were: "This butter is likely to go fishy." The bacteriological examination disclosed the fact that the butter contained a large number of the spores of *oïdium lactis*, and there are seven colonies of the same showing in the plate published herewith.

Illustration No. 4 refers to a butter which the grader placed just into second quality, with 84 points; his remarks being: "Some boxes are fishy, and the rest will probably become so." This plate contains nine colonies of *oïdium lactis* together with one large colony of a liquefying yeast; the other micro-organisms present being of a non-liquefying character.

Illlustration No. 5 represents a butter that was also classed as second, with 83 points. The grader's remarks were: "Butter arrived soft; some boxes are fishy, and no doubt the rest will become so." The bacteriological examination revealed six colonies of *oïdium lactis,* in the plate illustrated, and one colony of *Penicillium glaucum,* and several bacteria of no importance.

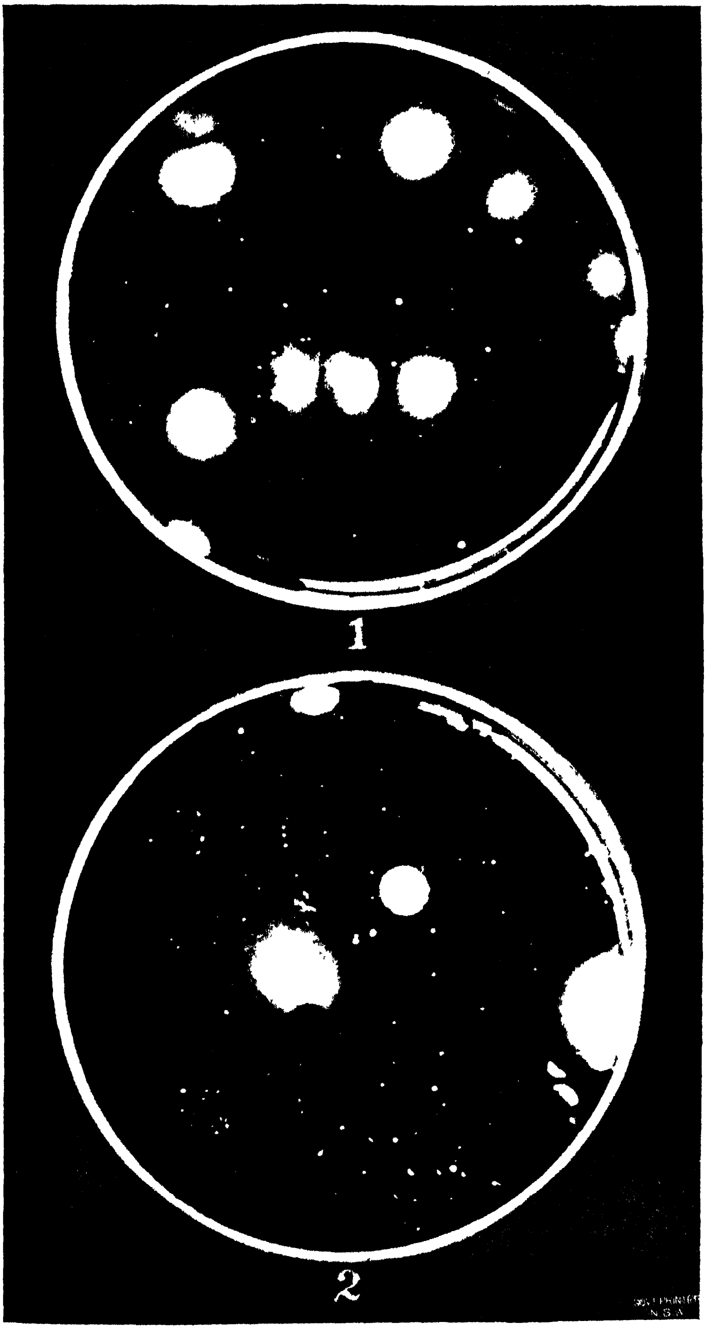
Judging by the above, the reader will have come to the conclusion that there was little necessity to make a bacteriological examination, as the graders had already pointed out that the butter was fishy; but I, perhaps, should have acquainted my readers with the fact that the graders in question have had considerable experience with me in detecting the flavour of a fishy butter, and in seeing the results of a bacteriological examination of same; therefore, should have the peculiarities of a butter developing fishinesss fixed thoroughly.

Illustration No. 6 refers to a sample taken by myself, of a third-quality butter, which was thoroughly off in flavour, and was so decomposed that it was not an easy matter to determine any particular flavour. However, I was of opinion that the butter had undergone a fishy fermentation with others, and the examination shows the presence of six colonies of *oïdium lactis,* and several liquefying bacteria.

It may be pointed out that, in very bad and old butters the bacteriological examination is not expected to represent the condition of the butter, because when a butter has undergone a considerable amount of decomposition, several varieties of bacteria, which have done their work, may have ceased to exist in a live state.

Illustration No. 7, however, tells rather a different tale, as far as the detecting of fishiness by palate and smell is concerned. This was a butter which the grader placed at 92 points, or well up into first-class, and had no suspicion that it would turn out fishy. It was a freshly-made butter, and was evidently made from cream, which, though contaminated with the spores of *oïdium lactis,* had not been held long enough before manufacture into butter to enable the organisms to form enough of the substance which gives the peculiar fishy taste.

This is really, as referred to higher up, the dangerous class of butter for the grader; and this is the class of butter wherein the grader will be greatly assisted by a bacteriological examination. This plate, will be seen, has about fifty colonies of *oïdium lactis* showing, therefore, it was not surprising to me to find that our reports from London had stated that the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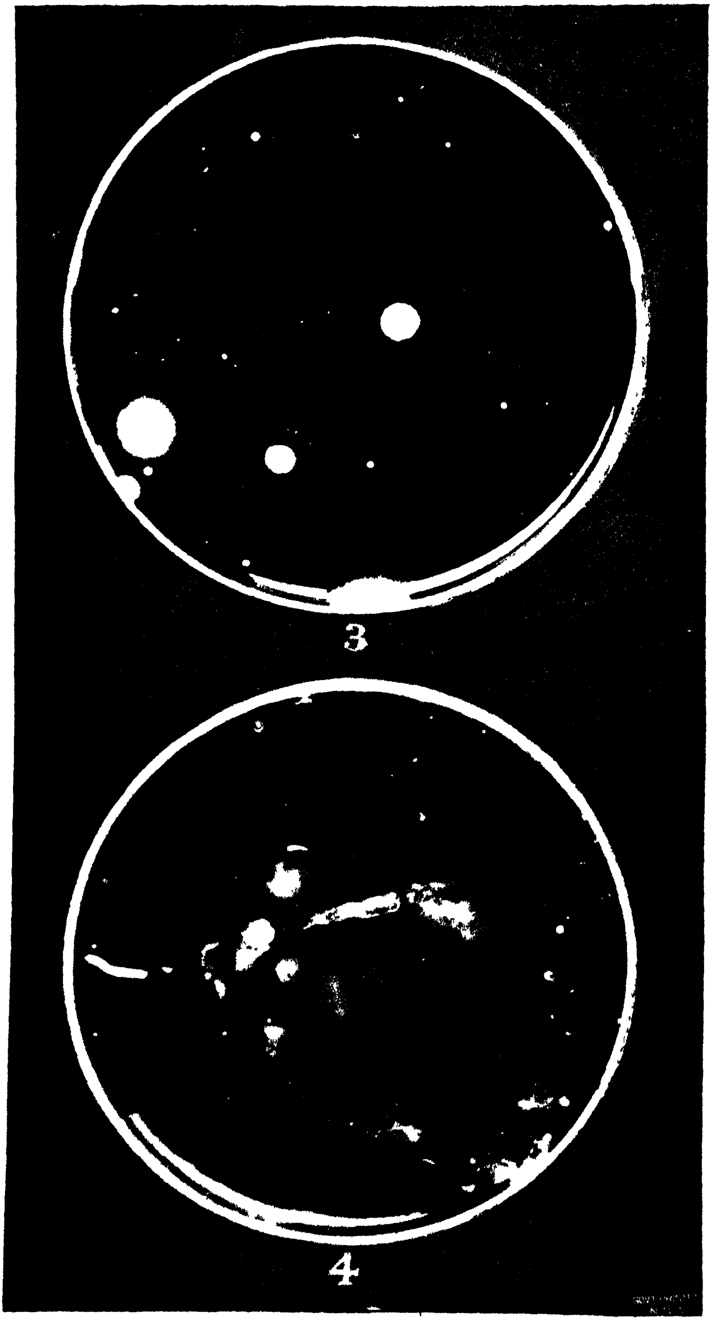
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produce of this factory was turning out fishy. In this connection it may be stated that our officer in London is never informed of any of the opinions formed here, and makes his report independently of what the opinions held may be.

Illustration No. 8 represents another butter deceptive to the grader. It obtained 88 points, which is only a low-grade first; but it comes from a factory in which I regarded the fishy season as having set in. It obtained 92 to 94 points regularly every week. This plate contained fourteen colonies of *oidium lactis*.

Unfortunately for the factory, this butter is losing its name in London, because of this development of a fishy flavour in a good many of its recent consignments.

For the guidance of the readers, the following scale of points, corresponding with the classes referred to, are given.

It will be noticed that, so far as illustrated, none of the butters getting superfine quality have shown fishiness or the presence of *oidium lactis*.

Classification.

Butter is classified as follows:—

First-class, superfine	94 to 100 points.
First-class	86 to 93 ,,
Second-class	75 to 85 ,,
Third-class ..	Under 75 ,,

The points will be awarded under the following headings:—

Flavour, including aroma .	maximum, 50 points.
Texture, including body, grain, and moisture	,, 30 ,,
Condition, including colour, salting, packing, and covering	,, 20 ,,

Rape.

R. W. PEACOCK.

A CONSIDERABLE proportion of farmers are annually realising that the old-time system of farming, in which the same class of crop is continuously grown, such as wheat for grain, and when the land becomes foul, wheat for hay, upon the same land year after year, has been found wanting.

Preparing the ground for sowing Rape.—Rolling.

Also, that if the best results are to be obtained, and fertility in reasonable measure maintained, the old ruts must be left and a more progressive policy pursued. Such men are realising the value of sheep in conjunction with wheat-growing.

To ensure the best returns from farmers' sheep, the lamb market must be catered for, and to ensure the best lambs, provision must be made to provide green succulent fodder for the flock. As a means to this end, rape claims an important position. Its value as a winter fodder has long been demonstrated, and the following appreciation of its merits seems almost superfluous.

Owing to the many inquiries respecting this crop, the following notes are written, which may in some measure assist those who have failed in the past, and others who contemplate mixed farming, to grow this valuable crop successfully.

Value as a Fodder.—From practical experiences in the field, rape has proved a nutritious fodder. In moist seasons it may err in being over-succulent and induce scouring. Trouble from such may be minimised by feeding dry grass, chaff, &c., in conjunction. In the laboratory, analyses have shown that it contains a fairly large proportion of nitrogenous substances.

As a sheep food it is extremely valuable, especially for ewes suckling lambs and the topping up of old gummy ewes. When the ordinary pas-

Preparing the ground for sowing Rape.—Scarifying.

tures are dry, the corrective effect of the rape is exceptionally desirable. In districts with temperate winters ten to twelve sheep may be depastured per acre throughout the winter. It, unfortunately, under certain conditions, may induce hoven or bloat.

It also is a good cattle food, excepting its liability to cause bloat and to taint the milk of dairy cows; for the latter it is preferable to feed it after it has been wilted and after milking.

For pigs it is very desirable, as they are not liable to hoven. When fed in conjunction with grain for topping off, excellent results are obtained.

In all classes of poultry farming it is valuable, and a run upon rape is very beneficial.

Soil.—The soils best adapted for rape are the rich friable loams. Those which grow maize and potatoes profitably are very suitable. With good

cultivation it grows satisfactorily upon our ordinary wheat soils. Where these have been depleted of their humus with its plant-food, and lacks that necessary physical condition, they require humouring, and an application of suitable manures is most important to promote a vigorous growth. Upon the poorer soils, the growth of a hardier crop, such as rye, to be ploughed under as a green manure, would be for rape a desirable forerunner.

Preparation of the Soil.—The land requires careful preparation. To ensure germination of the seed at a season of the year when showers are infrequent, the conservation of soil moisture is important.

To ensure this the land should be ploughed, whenever practicable, several months prior to sowing. Upon many wheat areas, such is imprac-

Preparing the ground for sowing Rape.--Drilling in seed

ticable, and when ploughing is finished, just prior to sowing, upon stubble land, considerable showers are necessary to ensure success. Such practice is attended with satisfactory results in good seasons.

The areas cut for hay could be ploughed earlier, thus having a longer period in which to satisfactorily prepare the soil. The surface should be worked down fine prior to seeding to allow the seed to be covered uniformly from ½ inch to 1 inch deep. The seed, being small, will not germinate when covered deeply.

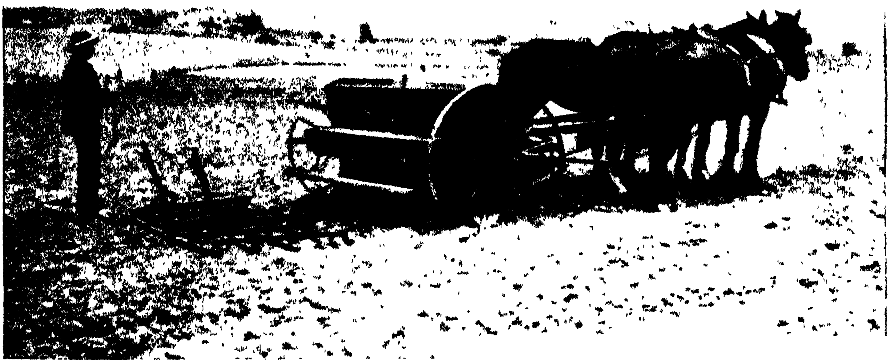
Varieties.—Throughout a number of experiments with Broad-leaved, Dwarf Essex, Colza, and Japan Rape, Dwarf Essex has, in every instance, given the best results from a fodder point of view.

Sowing.—In ordinary field practice upon the wheat farm, it is advisable to sow broadcast at the rate of 7 to 8 lb. per acre. The price of seed is from 3d. to 4d. per lb.

Under certain conditions it might be advisable to sow in drills, which should be about 3 feet apart, the seed required being from 1½ lb. to 2 lb. per acre.

To ensure the best results, all weeds should be kept down by constant cultivations between the rows, and as such cultivations conserve moisture, such practice allows of the growth of this crop under adverse conditions. Everything being equal, the drilled rape grows higher than the broadcasted, which is an advantage when cut and fed to stock.

The best time to sow is early autumn, during the latter half of February and the early part of March. In very cool districts a spring sowing would be preferable.



Broadcasting the Rape Seed.

Applying 1 cwt. of superphosphate per acre and covering seed at one operation.

Manuring.—When grown in small areas there is nothing equal to the ordinary farm-yard manure for this crop. Unfortunately, this material is produced in limited quantities, and large areas, if manured, must rely upon the concentrated fertilisers.

A manure containing about 15 per cent. of water-soluble phosphoric acid, about 2 per cent. nitrogen and 1 per cent. pure potash, applied at from 1 to 2 cwt. per acre is suitable. Upon light sandy soils, the proportions of nitrogen and potash should be increased. Upon many of the wheat soils an application of superphosphate alone, without either nitrogen or potash, may give good results. A few experiments will soon test the most desirable manure to use.

Feeding-off.—If the season proved favourable, it should be fit to graze in about eight to ten weeks after sowing. If there are several paddocks, they should be grazed alternately, one being grazed, say, for a fortnight,

and the others allowed to resuscitate. Continuous hard grazing is not satisfactory. If only one paddock, it should be subdivided and treated as above. Wire-netting and stakes make an excellent temporary subdivision for sheep, and areas of any size may be operated upon, it entailing very little labour to shift the fence. Such folding upon successive small areas ensures the most satisfactory returns.

Sheep or cattle should not be turned into rape whilst hungry; they should be allowed to fill themselves upon other foods first. When hungry they eat ravenously, and hoven or bloat may be set up and losses ensue.

To minimise this risk other foods should be available. It may be wise to have a crop of rye, barley, or wheat in one portion of the paddock upon which they could graze in conjunction with the rape. Quick-growing ryes and barleys, under certain conditions, could be sown to advantage with the rape, 15 lb. of rye or other cereal and 6 lb. of rape being sufficient seed per acre. Care should be taken during moist, windy weather

A Crop of Rape, Bathurst Experimental Farm.

conditions, as stock are more liable to bloat upon such fodders at such times. If any are bloated, Stockholm tar placed in the mouth, or bicarbonate of soda given as a drench are good correctives.

If scouring is induced by the over-succulence of the fodder, the stock should have access to a dry grass paddock or be fed partially upon dry hay or chaff.

In districts with moderate winters, the crop should grow throughout the winter, and carry from five to fifteen sheep per acre, or their equivalent.

In cold districts growth may be suspended throughout the colder months. Upon clay soils in districts of heavy winter rainfall the tramping of the stock would interfere with the satisfactory condition of the soil for its growth. Under such conditions, the sandy friable soils would be preferable for winter grazing.

Value as a Soil Renovator.—Besides its value as a fodder, it is extremely valuable as a soil renovator if treated with this end in view. Its

vigorous root system penetrates the subsoil for several feet, and comparatively large air-channels are formed upon the decay of the tap-roots, which assist materially in the amelioration of the soil.

Rape, in common with other plants having broad leaves, obtains comparatively large quantities of carbon from the atmosphere which, when large residues are ploughed under, as is profitably practicable with this crop, adds much to the humus of the soil.

A supply of humus is essential to the desirable increase of those beneficial micro-organisms of the soil so indispensable to fertility. It also allows the soil to retain a desirable physical condition necessary to the circulation of air throughout its interstices. Soils deficient in humus so readily get out of condition with heavy rains, and lack that liveliness which farmers like to see.

On account of the vigorous growth allowing such numbers of stock being carried for several months of the year, large quantities of readily soluble plant-food are returned to the soil in the forms of liquid and solid excreta.

Sheep depastured on Rape.

After the rape has been grazed all the winter, the stock should be taken off in spring, when other food is plentiful, and the rape allowed to run up to blossom. When full-grown, and before any seed is sufficiently matured to germinate, it should be ploughed into the soil for green manure. This is done about November, and the soil lies all the summer in a loose receptive condition to benefit from any thunderstorms or other rains.

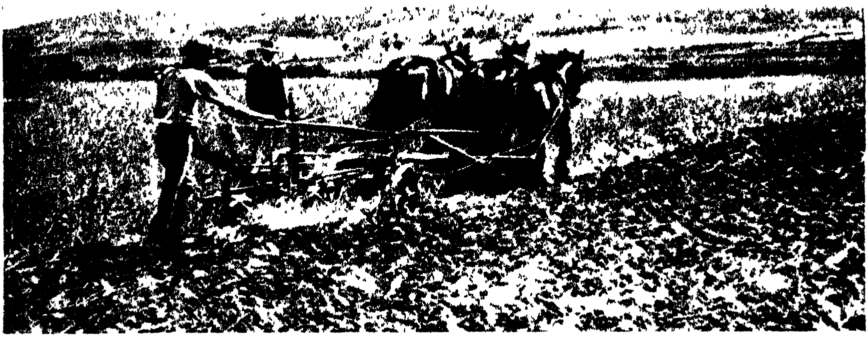
The ploughed surface keeps the soil cooler throughout the heat of summer, and such, in conjunction with the increased moisture retained, allows the soil bacteria, especially the nitrifying organisms, free scope for their various functions. By such means sufficient plant-food is rendered available to give the following wheat or other crops that desirable fillup during their early stages so necessary to vigorous development.

As a Soil Cleanser.—By grazing throughout the winter and ploughing during November before any weeds have ripened their seeds, it will be seen that the weeds peculiar to the common winter cereals, including the

dreaded wild oat and barley grass, have no chance whatever, and the following cereal crops are free from those weeds, which rob them of moisture and plant-food, and reduce the yields below the profitable standard.

It is on account of the above that wheat follows rape so advantageously in a rotation upon wheat soils.

The production of pure seed-wheat, from even old fields, under such a system is rendered practicable.



Student ploughing in Rape at Bathurst Experimental Farm.

By giving due regard to the above principles, it will be seen that many crops could be grown to advantage in conjunction with rape in rotations.

If the general tone of agriculture in the temperate districts of the State is to be uplifted, more fields must be placed under this desirable crop, and mixed farming practised, the backbone of which must be an intelligent system of crop rotation.

Sheep on Paspalum Grass.

THE value of the Romney Marsh sheep for the coast, particularly in the area of heavy rainfall of the northern rivers, has been amply demonstrated. The small flock kept at the Wollongbar Experiment Farm, Richmond River, has done remarkably well, and has shown no sign of foot-rot. The Acting Manager, Mr. A. H. Haywood, reports as follows:—"They mature early, and produce a good fleece, the average weight being about 7 lb. of wool. These sheep are kept on paspalum and do very well. The carrying capacity, at a very low estimate, may be put at ten sheep to the acre. Farmers in the district who have tried this breed speak very highly of them."

The Effects of some Fungicides recommended for the Prevention of "Stinking Smut" (Bunt) on the Germination of Wheat Seeds.

GEO. L. SUTTON AND J. T. PRIDHAM,
Cowra Experimental Farm.

THE field experiments, the details of which are now furnished, are in continuation of those carried out last season at this farm by the late Wm. Farrer and one of the writers. Whilst some of the sections of last season's experiment have been abandoned, the general scope of the investigation has been extended so as to include other points of interest, and especially those suggested by the previous experiments.

Planting the Experiments.

The present experiments have been designed to furnish answers to the following questions:—

I. Have the fungicides recommended for the farmer's use as preventives of "Smut" (Bunt) an injurious effect upon the vitality of the wheat grain; and, if so, are all varieties of wheat equally susceptible to the injurious effects of the fungicides?

II. Are the least injurious effects experienced when the seed is treated immediately before it is planted, or can the seed with safety be treated some time before it is intended to plant it?

III. To what extent do the solutions of formalin and bluestone as commonly used destroy the spores of "Smut" (Bunt) on the seed-grain, and so prevent the occurrence of the disease in the crop resulting from the planting of the treated seed?

IV. Do solutions of formalin and bluestone prevent reinfection to an appreciable extent?

V. What effect, protective or otherwise, have the different fungicides upon the vitality of the seed-grain when the seed is planted in soil which is too dry for the seed to germinate in, and which remains so for some time after the seed has been planted?

The complete answer to these questions has not been obtained in one season, and it was intended that the results should have been withheld until the

"Bobs" Wheat treated with Formalin.
The growth resulting from the planting of formalin-treated seed-wheat.

experiment had been repeated for two or more seasons. The results, however, in one section seem sufficiently conclusive to indicate that our farmers in treating their seed wheat in accordance with the general practice are suffering an unnecessarily severe loss. In order to call attention to this fact and to point out how this loss may be avoided, we feel warranted in publishing these results, incomplete though they be.

The nature of the experiment rendered it necessary that it be divided into several sections. These sections will be taken seriatim, and each discussed separately.

The procedure adopted in dealing with the seed for the different plots was very similar to that adopted last year, and was as follows :—

Untreated Grain.—In order that only heavy grain ("sinkers") should be used in the plots to be sown with untreated seed, as well as on the plots treated with fungicides, the light grains were removed from the whole of the grain to be used in the experiment by pouring it gently into a vessel containing cold water, the light grains ("floaters"), chaff, &c., which remained on the surface were removed, and the remainder of the grain dried. This operation was done rapidly enough to prevent the grain becoming more than wetted on the surface. Grain treated in no other way was regarded as untreated.

"Bobs" Wheat treated with Hot-water.

The growth resulting from the planting of seed-wheat treated with hot-water "Bobs," probably on account of its thin bran, seemed to suffer specially from treatment with "hot-water."

Grain treated with Formalin or Bluestone.—The seed for each plot was placed in a suitable vessel and a solution of the required strength poured over it. The grain was then stirred to ensure that every grain would be thoroughly wetted. After it had been immersed for five minutes, the solution was poured off and the seed dried in the sun or hung up to drain, as the nature of the experiment demanded.

Grain treated with Bluestone and Lime-water.—The seed for each plot was immersed in a solution of bluestone for five minutes, and after the solution of bluestone had been poured off, lime-water was poured on the seed and allowed to remain for about three minutes, the grain in the meantime being stirred about.

Grain treated with Bluestone and Slaked Lime.—The seed for each plot was immersed for five minutes in a solution of bluestone, and after the solution had been poured off, a liberal quantity of air-slaked lime was dusted over the damp seed, which was then spread out to dry.

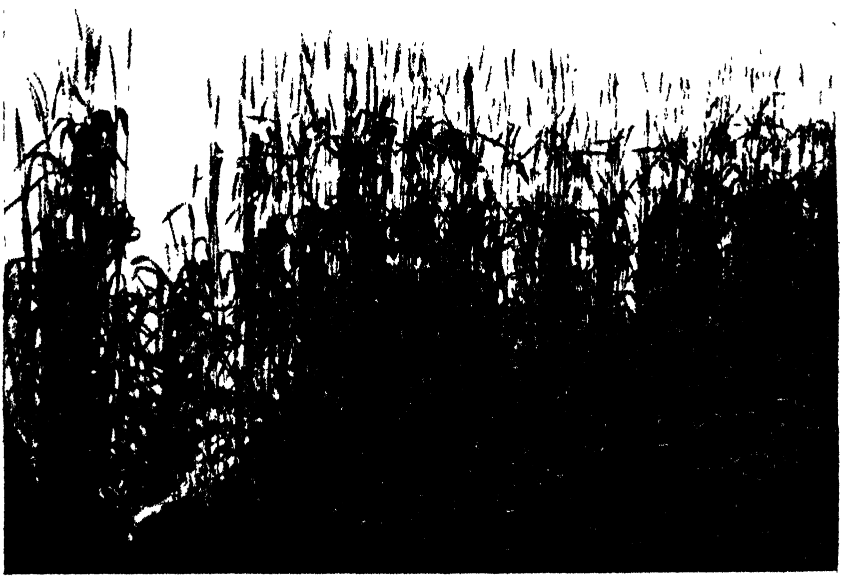
Grain treated with Hot-water.—The seed for each plot was placed in a small coarse bag and suspended for fifteen minutes below the surface of water, which was maintained at a temperature ranging between 132° and 135° Fahr. for fifteen minutes. When taken out of the hot water it was plunged immediately into a vessel containing cold water and allowed to remain there until cool. It was then dried, hung up, or planted, as the nature of the experiment demanded.

"Bobs" Wheat treated with Bluestone, 2 per cent. solution.
The growth resulting from the planting of bluestone (2 per cent.) treated seed-wheat.

In this experiment the examination of the relative effects of the different fungicides upon the vitality of the seeds has been made by comparing the number of germinations which resulted from seeds planted after being treated in a particular way with the number of germinations resulting from planting the same number of untreated seeds at the same time.

It has been assumed that the difference between the number of germinations resulting from the planting of untreated seed and that resulting from the planting of seed treated in some particular way is the number of seeds which have been killed by that particular treatment. It will be noted in some cases

that the actual number of germinations from treated seeds is greater than the germinations from the same number of untreated seeds, that, in fact, treatment with a fungicide has apparently had the effect of increasing the germinating quality of the grain. In such cases the sign of subtraction (–) has been placed before the number in the column denoting the number apparently killed by the fungicide. Such anomalies are only to be expected in experiments of this character where the conditions are so varied and are not completely under the experimenter's control, but it was hoped, on account of the precaution taken to remove the light grains from the untreated seed, that this apparent inconsistency would have been almost if not entirely eliminated.



"Bobs" Wheat "Untreated."
The growth resulting from the planting of untreated seed.

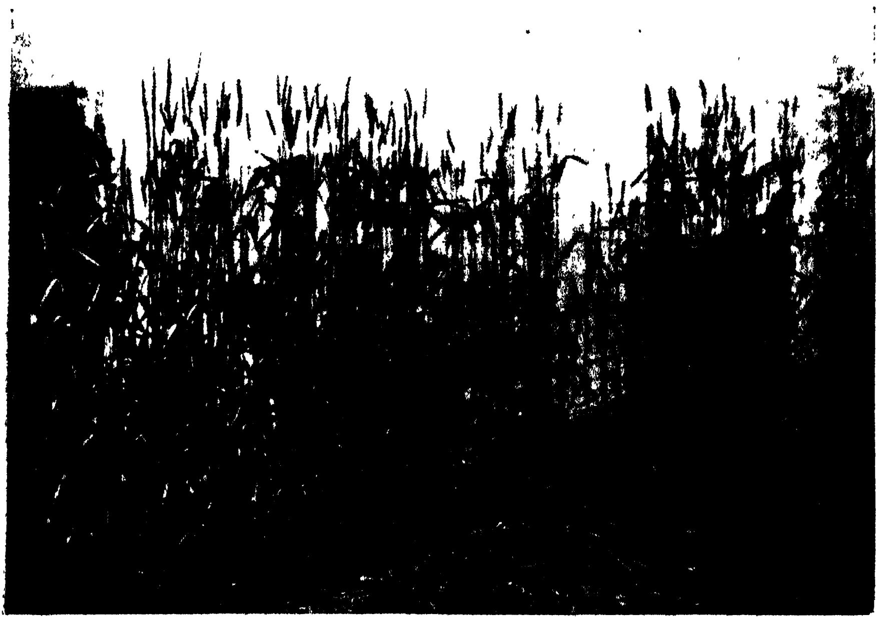
The difficulty of obtaining confirmatory results in an experiment like this will be recognised if the figures in Table V, showing the number of seeds which germinated as the result of planting untreated seeds, are examined. It will be seen that there is a considerable difference in the number of plants which resulted from planting the same number of untreated seeds of the same variety, on the same day, and in plots close to, but not adjacent to each other. On an average there was a difference with the three varieties of 14 per cent.; with Bobs there was a difference of 10·5 per cent., with Federation 16 per cent., and with Cretan 21 per cent.

Similarly, in examining the figures in Table VI it will be seen that variations also occur when the same seed is planted on different dates. With Bobs

and Cretan there is a variation of 8 per cent., and with Federation 3·6 per cent.

From observations made during the planting and progress of the experiment, it appears probable that these differences were caused in some measure by the depredations of grain-eating insects, which were fairly plentiful. This view seems to be supported by the fact that the percentage of plants which grew from the untreated seeds when planted (Section V) in dry soil, from which there is every reason to believe grain-eating insects were absent, is considerably greater than the percentage of plants which grew from the same seed planted in the field.

As these apparent inconsistencies are most frequent in plots sown with seed treated with bluestone or bluestone and lime, it seems likely that these methods



"Bobs" Wheat treated with Bluestone and Slaked Lime.

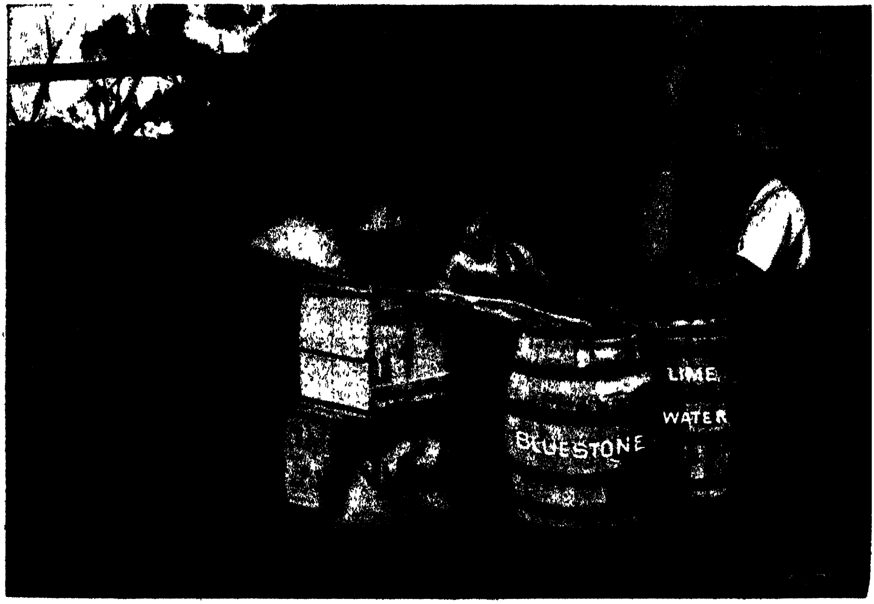
The growth resulting from the planting of seed-wheat treated with bluestone (2 per cent.) and slaked lime.

of treatment have acted as deterrents to insect pests, and it is natural to suppose that the film left by these substances on the seed would be repugnant to insect life.

The soil on which the experiments were planted was a chocolate granitic loam, free enough to be suitable for the purpose, and as uniform in texture as one would expect to obtain. Owing to the land being new, its character was not as even as was desired, but this defect will gradually be removed as the land continues to be culivated. It was in excellent tilth, moist and warm. The conditions for germination throughout the trial were good.

Every possible care was taken to have the whole of the seed planted under conditions as uniform and regular as possible; the experience gained with the previous experiment of this character was helpful in this direction. The seed, one grain at a time, was dropped by hand in holes which were made at a regular uniform depth—1½ inches—and distance apart—3½ inches—by means of a toothed wheel. The seed, after it was dropped, was compressed into the moist soil by having a heavy wheel rolled over it; it was then covered with loose earth by means of a rake.

The counting of the plants was commenced as soon as they were observed above the ground, and was continued at intervals of about seven days until it was considered no more plants would appear.



Treating wheat for "Smut."—The Bluestone-Lime-water treatment.
After being immersed in the bluestone solution for five minutes and the superfluous solution drained off, the "butts" are immersed into lime-water for a few minutes.

Section I.

Object:—To determine whether the methods most commonly used in this State for the prevention of "Smut" have an injurious effect upon the germination of the wheat grain, and if so, whether some varieties are more resistant to the effects of fungicides than others.

In this trial eighteen varieties were compared with each other. Two hundred seeds of each variety were subjected to the same treatments, at the same time, and planted on the same day under similar conditions. After being treated as required by the experiment, the seed was dried in the sun, and planted on the following day.

In the following table will be found a list of the varieties, with details as

TABLE I.

SHOWING the number of seeds which, after treatment with the different fungicides, germinated at killed by the treatments. The seed was treated

Plot No.	Variety	Formalin, 1: 400.						Hot-water, 132° to 134°					
		2/7/06.	9/7/06.	16/7/06.	30/7/06.	Number killed.	Percentage killed.	2/7/06.	9/7/06.	16/7/06.	30/7/06.	Number killed.	Percentage killed.
M 60-65	Beloglino	70	87	94	97	37	18·5	46	82	86	90	44	22·0
M 66-71	Bobs	128	152	154	154	22	11·0	22	47	49	50	126	63·0
M 72-77	Bunyip	149	157	157	155	12	6·0	131	154	156	162	5	2·5
N 60-65	Comeback	148	148	148	145	25	12 5	130	141	141	141	29	14·5
N 66-71	Cretan	103	110	114	113	38	19·0	87	106	116	116	35	17·5
N 72-77	(D'Arblay's x 14 x Jonathan)	182	184	187	186	−9	−4·5	167	172	174	174	3	1·5
P 60-65	Farmers' Friend	170	169	169	177	−6	−3·0	143	154	158	164	7	3·5
P 66-71	Federation	142	154	154	153	16	8·0	127	150	157	158	11	5·5
P 72-75	Gilgandra	104	121	121	123	7	3·5	21	35	40	42	88	44·0
Q 60-65	Haynes' Blue Stem	157	159	160	163	8	4·0	155	172	173	174	−3	−1·5
Q 66-71	Improved Fife	126	135	134	138	9	4·5	88	114	118	120	27	13·5
Q 72-77	John Brown	160	160	159	162	18	9·0	111	144	143	143	37	18·5
R 60-65	Jonathan	163	168	170	171	17	8·5	106	166	166	166	22	11·0
R 66-71	Jumbuck	163	161	158	163	3	1·5	120	141	142	145	21	10·5
R 72-77	Lambrigg White Lammas	158	167	168	169	3	1·5	101	125	127	134	38	19·0
S 60-65	Purple Straw	149	155	161	163	15	7·5	67	122	132	130	48	24·0
S 66-71	Saratow	140	147	155	151	−2	−1·0	98	128	130	132	17	8·5
S 72-75	White Tuscan	131	143	150	150	34	17·0	126	139	139	140	44	22 0
	Average of 18 varieties	141·4	148·7	150·7	151·8	13·2	6·6	102·5	127·2	130·3	132·2	32·8	16·4
	Average percentages of total germinations on dates given	93·1	98·0	99·3	100	.	..	77·4	96·2	98·5	100·	..	..

TABLE II.

SHOWING the number of seeds which, after treatment with the different fungicides, germinated at killed by the treatments. The seed was treated 24/7/06,

Plot No.	Variety.	Formalin 1 : 400.					Hot-water.				
		Germinations.			Plants killed by the treatment.		Germinations.			Plants killed by the treatment.	
		13/8/06.	20/8/06.	27/8/06.	Number.	Per-centage.	13/8/06.	20/8/06.	27/8/06.	Number.	Per-centage.
W 1-6	Bobs	151	163	165	2	1·0	26	56	70	97	48·5
W 7-12	Cretan	114	125	130	5	2·5	64	87	94	41	20·5
W 13-18	(D'Arblay's x 14 x Jonathan)	179	179	182	−7	− 3·5	72	110	127	48	24·0
W 19-24	Federation	129	142	145	11	5·5	61	95	113	43	21·5
X 1-6	John Brown	174	182	183	−21	10·5	139	156	102	..	..
X 7-12	Jonathan	157	165	163	7	3·5	57	89	94	38	19·0
X 13-18	Jumbuck	164	173	175	2	1·0	107	133	179	−2	−1·0
X 19-24	Purple Straw	168	174	182	−1	−·5	117	144	151	30	15·0
	Average of 8 varieties	154·5	162·7	165·6	−·3	−·1	80·7	108·7	123·7	41·6	20·8
	Average percentage of total germinations on dates given	93·3	98·3	100·	..	..	66·5	87·9	100·	..	..

to their treatment and germination:—

SECTION I.

stated periods during the trial; also the number and percentage of seeds which were apparently 12/6/06, and 200 seeds were planted in each plot on 13/6/06.

Bluestone, 2 %.						Untreated.				Bluestone, 2 %, and Slaked Lime.						Bluestone, 2 %, and Lime-water.					
2/7/06.	9/7/06.	16/7/06.	30/7/06.	Number killed.	Percentage killed.	2/7/06.	9/7/06.	16/7/06.	30/7/06.	2/7/06.	9/7/06.	16/7/06.	30/7/06.	Number killed.	Percentage killed.	2/7/06.	9/7/06.	16/7/06.	30/7/06.	Number killed.	Percentage killed.
40		62	65	69	34·5	118	129	129	184	132	128	136	143	−9	−4·5	105	118	121	128	11	5·5
50	89	102	12	64	32·0	162	174	174	176	155	161	164	162	14	7·0	152	160	162	162	14	7·0
58	83	99	07	60	30·0	166	169	109	167	155	161	167	173	−6	−3·0	142	152	152	154	13	6·5
102	109	116	128	42	21·0	170	170	175	170	177	175	180	183	−13	−6·5	177	181	181	184	−14	−7·0
47	71	80	83	68	34·0	144	149	151	151	113	127	132	129	22	11·0	98	113	120	120	31	15·5
131	157	161	164	13	6·5	178	176	178	177	184	185	187	189	−12	−6·0	165	173	174	175	2	1·0
66	87	91	107	64	32·0	165	170	109	171	166	181	180	185	−14	−7·0	153	159	168	166	5	2·5
66	90	104	119	50	25·0	166	167	169	169	149	161	158	163	6	3·0	113	127	130	131	38	19·0
36	50	58	64	66	33·0	110	128	130	130	108	127	126	134	−4	−2·0	109	122	122	132	−2	−1·0
108	129	138	146	25	12·5	174	174	175	171	153	154	158	158	13	6·5	166	180	185	187	−16	−8·0
68	85	87	100	47	23·5	136	148	151	147	112	121	122	126	21	10·5	100	114	122	125	22	11·0
104	136	147	160	20	10·0	179	180	182	180	156	171	177	176	4	2·0	170	172	180	176	4	2·0
68	89	91	114	74	37·0	187	185	189	188	131	161	163	163	25	12·5	122	148	157	160	28	14·0
100	133	135	147	19	9·5	171	166	160	166	155	170	176	173	−7	−3·5	157	157	171	170	−4	−2·0
110	127	134	147	25	12·5	172	169	168	172	150	158	161	166	6	3·0	151	152	170	186	−14	−7·0
105	126	126	135	43	21·5	176	178	185	178	158	169	168	161	17	8·5	167	166	171	177	1	0·5
112	129	140	137	12	6·0	136	144	145	149	126	145	143	141	8	4·0	124	136	140	145	4	2·0
112	113	127	130	54	27·0	180	183	183	184	137	142	151	154	30	15·0	136	148	153	157	27	13·5
81·8	103·8	110	120·2	44·8	22·4	161·0	164·2	165·6	165·1	145·2	155·3	158·2	160	5	2·5	139·6	148·7	154·3	157·2	7·8	3·9
68·1	86·5	91·6	100·	..	..	97·6	99·6	100	100·	89·9	97·1	98·9	100·	..	..	88·8	94·6	98·1	100·	.	.

SECTION I.

stated periods during the trial; also the number and percentage of seeds which were apparently and 200 seeds were planted in each plot on 25/7/06.

Bluestone, 2 %.					Untreated.			Bluestone, 2 %, and Slaked Lime.					Bluestone, 2 %, and Lime-water.				
Germinations.			Plants killed by the treatment.		Germinations.			Germinations.			Plants killed by the treatment.		Germinations.			Plants killed by the treatment.	
13/8/06.	20/8/06.	27/8/06.	Number.	Per-centage.	13/8/06.	20/8/06.	27/8/06.	13/8/06.	20/8/06.	27/8/06.	Number.	Per-centage	13/8/06.	20/8/06.	27/8/06.	Number.	Per-centage.
55	90	133	34	17·0	165	168	167	144	157	156	11	5·5	148	151	161	6	3·0
43	67	76	59	20·5	122	136	135	118	130	143	−8	−4·0	108	128	130	5	2·5
115	130	137	38	19·0	168	171	175	158	164	168	7	3·5	164	172	174	1	·5
55	106	127	29	14·5	155	154	156	121	139	154	2	1·0	140	150	150	6	3·0
114	161	165	−3	−1·5	145	163	162	154	162	165	−3	−1·5	145	163	170	−8	−4·0
102	117	125	45	22·5	164	164	170	183	186	185	−15	−7·5	171	179	184	−14	−7·0
150	169	176	1	·5	163	176	177	170	177	179	−2	−1·0	167	174	180	−3	−1·5
101	144	151	30	15·0	172	181	181	133	148	155	26	13·0	183	188	189	−8	−4·0
81·8	124·1	136·2	29·1	14·5	156·7	164·1	165·3	146·3	159·0	163·1	2·2	1·1	153·2	163·1	167·2	−1·9	−·9
67·4	91·1	100·	..	..	94·8	99·3	100·	90·5	97·4	100·		..	91·7	97·5	100·	..	..

On examining Table I it will be seen that the treatment with bluestone has apparently destroyed 22·4 per cent. of the seed. As this amount seemed excessive, and was not in accordance with the results obtained last year, it was thought that perhaps some mistake had inadvertently been made when preparing the bluestone solution. To confirm or refute the results obtained, a second trial was determined upon and carried out; the seed used being from the same source as that used in the first trial. Unfortunately, similar seed of only eight varieties was found to be available, and in consequence the first trial could not be repeated in its entirety.

In Table II will be found the results of this second trial.

The average loss which occurs when 25 bags (100 bushels) of seed-wheat are treated with a 2 per cent. solution of Bluestone, or with Hot-water.

It will be seen that these results are, on the whole, as confirmatory of those in the first trial as can be expected in experiments of this character, where the conditions during the different trials are very rarely the same. The rainfall during the progress of this portion of the experiment was greater and more constant than during the first portion.

By taking an average of the results of the two trials we find that treatment with—

Hot-water	apparently kills	18·6	per cent. of the seed.
Bluestone	" "	18·4	"	"
Formalin	" "	3·7	"	"
Bluestone and slaked lime	" "	1·8	"	"
" lime-water	" "	1·5	"	"

Whilst these figures show the large quantity of seed which is destroyed by some of the fungicides, viz., hot-water and bluestone, they do not indicate the extent to which the vigour of the plants resulting from seed treated with them is impaired. By examining the figures at the foot of Tables I and II under the heading "Average percentage of total germinations on dates given," it will be seen that the germination was retarded to some extent by all the different treatments, and in the following order, commencing with formalin, which retarded the germination least:—Formalin, bluestone and slaked lime, bluestone and lime-water, hot-water, bluestone.

The average loss which occurs when 25 bags (100 bushels) of seed-grain are treated with—

Formalin, 1 to 400

Bluestone, 2 per cent., and slaked lime or lime-water.

The lessened vigour of the plants, in the plots planted with treated seed, was quite apparent to those who had an opportunity of seeing the different plots whilst growing. It is only natural to suppose that if the vigour of the plants is lessened, the yield will be reduced, thus a serious loss, in addition to the one resulting from the destruction of the seed grain, is likely to be experienced by a reduction of the yield from the resulting crop.

In order to obtain some idea as to whether such a loss did occur, and if so, the amount of it, the yield of grain from plots of three varieties, which had been treated with the different fungicides, was compared with that from untreated plots of the same three varieties.

The results obtained are given in Table III.

TABLE III. SECTION I.

THE actual yield per plot and computed yield per acre from plots sown, with untreated seed and with seed treated with different fungicides.

	Formalin.		Hot-water.		Bluestone.		Untreated.		Bluestone and Slaked Lime.		Bluestone and Lime-water.	
	Plot.	Acre.	Plot.	Acre.	Plot.	Acre.	Plot.	Acre.	Plot.	Acre.	Plot.	Acre.
	lb. oz.	bus. lb.	lb. oz.	bus. lb.	lb. oz.	bus. lb.	lb. oz.	bus. lb.	lb oz.	bus. lb.	lb. oz.	bus. lb.
Bobs	4 1	35 37	2 10	23 1	2 5	20 17	4 7	38 55	3 2	27 24	3 7	30 9
Cretan	2 7	21 22	2 1	18 5	2 0	17 32	3 4½	28 46	2 9	22 18	2 1	18 57
Federation	2 7	21 22	2 8	21 55	1 14	16 26	3 3	27 57	3 10	31 47	2 11	23 34
Average	..	26 7	..	21 0	..	18 4	..	31 39	..	27 9	..	23 56

As the plots are very small, being only 83 links long and 2¼ links wide, the results obtained do not possess any great value, and certainly cannot be taken as final; but they certainly indicate that treatment with fungicides exercises anything but a beneficial influence on the yield.

The ameliorating effect of lime after bluestone is clearly shown, thus emphasing the need brought out by the results given in Tables I and II, of supplementing the bluestone treatment by an additional one with lime in some form or other. It was the importance of this matter, which is confirmed by results obtained in other sections of this experiment, which led to these results being published.

From Tables I and II, Table IV has been compiled, showing the effect which the different fungicides have had upon the vitality of the varieties tried.

Whilst it appears from Table IV that varieties differ in their resistance to the effects of fungicides, the results are not very conclusive, and it is inadvisable to draw conclusions from them at this early stage of the experiment.

Section II.

Object:—To determine whether it is advisable to treat the seed just prior to planting it, or whether it can with safety be treated some time before it is intended to plant it; and if so, whether the seed requires to be thoroughly dried after treatment, or whether it is sufficient to simply allow the superfluous moisture to drain off the grain which is left in bulk.

This section was divided into two divisions, the first, in which the seed immediately after treatment was spread out in the sun and dried; and the second, in which the seed after being treated was not dried, but was hung up in bulk in an open shed so that the superfluous moisture would drain away.

In the first division three varieties were treated with the same fungicides on five different occasions, at stated intervals, and planted on the same day. The results obtained, together with details as to date of treatment, are shown in Table V.

TABLE IV. SECTION I.

SHOWING the Percentage of Seeds destroyed by treatment with different Fungicides.

Name of Variety.	Percentage of Seeds apparently killed by—														
	Formalin.			Hot-water.			Bluestone, 2 %.			Bluestone, 2 %, and Slaked Lime.			Bluestone, 2 %, and Lime-water.		
	1st Trial.	2nd Trial	Average	1st Trial.	2nd Trial.	Average.	1st Trial.	2nd Trial.	Average.	1st Trial.	2nd Trial.	Average.	1st Trial.	2nd Trial.	Average.
Beloglino	18·5	....	18·5	22·0	....	22·0	34 5	....	34·5	−4·5	....	−4·5	5·5	...	5·5
Bobs	11·0	1·0	6·0	63·0	48·5	55·7	32·0	17 0	24·5	7·0	5·5	6·7	7·0	3·0	5·0
Bunyip	6·0	...	6·0	2·5	.	2·5	30·0		30·0	−3·0	....	−3·0	6·5	....	6·5
Comeback	12·5	...	12·5	14·5	. .	14·5	21·0	.	21·0	−6·5	.. .	−6·5	−7·0	....	7·0
Cretan	19·0	2·5	10·7	17·5	20·5	19·0	34·0	29·5	31·7	11·0	−4·0	3·5	15·5	2·5	9·0
(D'Arblay's x 14 x Jonathan)	−4·5	−3 5	−4·0	1·5	24·0	12·7	6·5	19·0	12·7	−6·0	3·5	−1·7	1·0	·5	·7
Farmers' Friend	−3·0	....	−3·0	3·5	....	3·5	32 0	....	32·0	−7·0	....	−7·0	2·5	....	2·5
Federation	8·0	5·5	6 7	5 5	21 5	13·5	25·0	14 5	19·7	3·0	1·0	2·0	9·0	3·0	6·0
Gilgandra	3·5	....	3·5	44 0	...	44·0	33·0	. .	33·0	−2·0	....	−2·0	−1·0	.. .	1·0
Haynes' Blue Stem	4·0	...	4·0	−1·5	....	−1·5	12·5	....	12·5	6 5	....	6·5	−8·0	....	−8·0
Improved Fife	4·5	....	4·5	13·5	.. .	13·5	23·5	....	23·5	10·5	....	10·5	11·0	....	11·0
John Brown	9·0	−10·5	−·7	18·5	.	18·5	10·0	−1·5	4 7	2·0	−1·5	·7	2·0	−4·0	−1·0
Jonathan	8·5	3·5	6·0	11·	19·0	15·0	37·0	22·5	29·7	12·5	−7·5	2·5	14·0	−7·0	3·5
Jumbuck	1 5	1 0	1·7	10 5	−1·0	4·7	9·5	·5	5·0	−3·5	−1·0	−2·7	−3·0	−1·5	−1·7
Lambrigg White Lammas	1·5	.	1·5	19·	....	19·0	12·5	....	12 5	3·0	....	3·0	−7·0	....	−7·0
Purple Straw	7·5	−·5	3·5	24·	15·0	19·5	21·5	15·0	18·7	8·5	13·0	10·5	·5	4·0	1·7
Saratow	−1·0	. .	−1·0	8·5	..	8·5	6·0	....	6·0	4·0	....	4·0	2·0	....	2·0
White Tuscan	17·0	..	17·	22·0	....	22·0	27·0	...	27·0	15·0	...	15·0	13·5	....	13·5

TABLE V. SECTION II.

SHOWING the effect of treating the seed just prior to planting and at periods of different length before planting, the seed being dried in the sun in each case after treatment. The planting was done on 13/6/06.

Plot.	Variety.	Date treated.	Formalin, 1 : 400.			Hot-water, 132°-135° F.			Bluestone, 2 %.			Untreated.	Bluestone, 2 %, and Slaked Lime.			Bluestone, 2 %, and Lime-water.		
			Germinations.	Killed by treatment.		Germinations.	Killed by treatment.		Germinations.	Killed by treatment.		Germinations.	Germinations.	Killed by treatment.		Germinations.	Killed by treatment.	
			31/7/06.	No.	%	31/7/06.	No	%	31/7/06.	No.	%	30/7/06.	30/7/06.	No.	%	30/7/06.	No.	%
M 42–47	Bobs	21/3/06 12 weeks before planting	139	132	22·0	134	169	26·5	71	219	36·5	165	150	46	7·6	152	74	12·3
M 48–53	Cretan		110			72			92			155	127			110		
M 54–59	Federation		117			133			116			178	175			162		
N 42–47	Bobs	9/4/06 9 weeks before planting	119	156	26·0	77	177	29·5	48	284	45·6	161	143	103	17·1	135	116	19·3
N 48 53	Cretan		78			101			65			151	81			108		
N 54–59	Federation		124			122			80			165	150			118		
P 42–47	Bobs	24/4/06 7 weeks before planting	136	79	13 3	102	129	21·5	50	263	43·8	156	151	31	5·1	133	91	15·1
P 48–53	Cretan		103			100			51			122	110			88		
P 54–59	Federation		124			111			78			164	150			130		
Q 42–47	Bobs	10/5/06 5 weeks before planting	147	19	3·1	89	142	27·0	83	96	16·0	155	145	—5	—0·8	133	16	2·6
Q 48–53	Cretan		113			105			99			113	129			110		
Q 54–59	Federation		135			78			136			146	145			155		
S 42-47	Bobs	13/6/06 Immediately before planting	154	76	12·6	50	172	28·6	112	172	30·3	176	162	42	7·0	162	83	13·8
S 49–53	Cretan		113			116			83			151	129			120		
S 54–59	Federation		153			158			119			169	163			131		

TABLE VI. SECTION II.

SHOWING the effect of planting immediately after treatment, and at intervals of varying length after treatment. The seed was not dried after treatment, but was hung up in bags in a draught, and allowed to drain. The seed was treated on 12/6/06.

Plot.	Variety.	Date planted.	Formalin, 1 : 400. Germinations.	Formalin, Killed by treatment. No.	Formalin, Killed by treatment. %	Hot-water, 132°-135° F. Germinations.	Hot-water, Killed by treatment. No.	Hot-water, Killed by treatment. %	Bluestone, 2 %. Germinations.	Bluestone, Killed by treatment. No.	Bluestone, Killed by treatment. %	Untreated. Germinations.	Untreated. % germinated.	Cold-water. Germinations.	Cold-water. Killed by treatment. No.	Cold-water. Killed by treatment. %
N 78-82	Bobs	13/6 06 Immediately after treatment	164	—23	—3·8	46	262	43·6	145	52	8·6	150		167	—4	—·6
P 83-87	Cretan		182			130			134			167		156		
R 78-82	Federation		181			66			173			187		185		
			527			242			452			504	84·0	508		
N 83-87	Bobs	28/6 06 2 weeks after treatment	136	3	·5	52	155	25·8	89	83	13·8	128		126	41	6·8
Q 78-82	Cretan		140			116			117			128		125		
R 83-87	Federation.		142			98			122			165		129		
			418			266			328			421	70·1	380		
P 78-82	Bobs	5 7 06 1 month after treatment	178	—5	—1·0	37	246	41·0	140	77	12·8	176		156	11	1·8
Q 83-87	Cretan		165			134			133			176		174		
S 78-82	Federation.. ..		195			115			182			180		191		
			538			286			455			532	88·6	521		
A 1-4	Bobs	21 9/06 3 months after treatment	119			2			42					127		
A 5-8	Cretan		150			80			128					151		
A 9-12	Federation.. . ..		172			21			124					165		
			441			103			294					443		

The results shown in Table V are not conclusive enough to warrant any deduction being made. They are useful in that they confirm the conclusion drawn from the results of the previous section as to the advantage of the combined treatment of bluestone and lime over the bluestone treatment.

In the second division about 1 bushel each of three varieties was treated with different fungicides on the same date; at the same time 1 bushel each of the three varieties was immersed in cold water for five minutes, so that by comparing the results obtained from untreated seed, and from seed thus treated, with those obtained from seed treated with fungicides, it could be determined whether the injurious effects, if any, were due as much to the fact that the grain had been wetted, as to the action of the fungicide. The grain, after immersion in cold water, or after treatment with fungicides, was not dried, but was hung up in bags in an open shed, and allowed to drain. Sufficient seed was taken from these bags as it was periodically required for planting.

Plantings were to have been made as follows:—1st, immediately after treatment; 2nd, one week after treatment; 3rd, two weeks after treatment; 4th, one month after treatment; and 5th, three months after treatment. This programme could not be adhered to, for at the time it was intended to make the second planting, the weather was too showery to admit of it being done.

When about to make the fourth planting, it was found that the untreated seed had by some accident been mislaid. The results obtained from the plots planted with treated seed cannot, therefore, in this instance, be compared with those obtained from plots planted with untreated seeds; but from the results of the other plantings, it seems reasonable to assume that the results from untreated seed would not have been materially different from those obtained with seed which had been immersed in cold water.

At the end of three months, the seed which had been treated with hot water was mouldy and half rotten.

Table VI.—Beyond the fact that seed treated with hot water becomes mouldy and half rotten three months after it has been so treated, it is inadvisable to draw any conclusions at this date.

Section III.

Object:—To determine to what extent solutions of bluestone and formalin prevent the occurrence of "Smut" in a crop resulting from the planting of treated seed.

Seed of a "Smut" liable variety (Bobs) was chosen for this experiment, and after being thoroughly infected with "smut," by being shaken about in a suitable vessel containing a quantity of crushed up "smut" balls, it was treated with (1) Formalin, 1 : 400; (2) Bluestone, 1 : 50; (3) Bluestone, 1 : 75; (4) Bluestone, 1 : 100. Plots of seed thus treated were planted.

At a suitable time after flowering an examination of the plants in the different plots was made, and the number of smutty plants determined. A

comparison made between the number of bunty plants which were found in the various plots shows the relative efficacy of the different treatments.

The results obtained are shown in Table VII.

TABLE VII. SECTION III.

SHOWING the relative efficacy of the different treatments. Variety used, Bobs. Seed treated and planted, 13/6/06.

Plot.	Treatment.	No. of Seeds planted.	No. of Seeds germinated.	Percentage germinated.	No. of Smutted Plants.	Percentage of Smutted Plants.
M 78	Formalin, 1 : 400	200	150	75·00	10	6·66
M 79	Bluestone, 1 : 50	200	136	68·00	8	3·67
M 80	,, 1 : 75	200	146	73·00	9	6·16
M 81	,, 1 : 100	200	157	78·50	11	7·00

These results cannot be accepted as final unless confirmed by those obtained in the future. Until then they will serve as a guide. They indicate that the treatments are effective in the following order :—

Bluestone ...	... 1 : 50	with	3·67	per cent. of	bunty plants.
Bluestone ...	... 1 : 75	,,	6·16	,,	,,
Formalin ...	... 1 : 400	,,	6·66	,,	,,
Bluestone ...	... 1 : 100	,,	7·00	,,	,,

Section IV.

Object :—To determine whether solutions of formalin and bluestone prevent the reinfection with "Smut" of seed which has been treated with them.

For this section, seed of a "smut" liable variety (Bobs) was treated with (1) Formalin, 1 : 400 ; (2) Bluestone, 1 : 50 ; (3) Bluestone, 1 : 75 ; (4) Bluestone, 1 : 100. Seed thus treated, as well as untreated seed, was then infected with bunt as in Section III. Plots so treated were planted, as also was a plot of uninfected and untreated seed, so as to determine the extent to which this variety was bunt liable.

As in Section III, an examination of the plants was made after flowering, and the number of "smutty" plants determined.

In Table VIII will be found the results of this examination, as also the details of treatment.

TABLE VIII. SECTION IV.

SHOWING the extent to which the different fungicides prevent the reinfection of seeds treated with them. Variety used, Bobs. Planted on 13/6/06 after being treated, dried, and then infected.

Plot.	Treatment.	No. of Seeds planted.	No. of Seeds germinated.	Percentage Seeds germinated.	No. of Smutted Plants	Percentage Smutted Plants.
M 82	Untreated, but not infected	200	181	90·5	1	0·55
M 83	,, but infected	200	164	82·0	127	77·43
M 84	Formalin, 1 : 400	200	128	64·0	91	71·08
M 85	Bluestone, 1 : 50	200	88	44·0	14	15·90
M 86	,, 1 : 75	200	109	54·5	25	22·93
M 87	,, 1 : 100	200	144	72·0	27	18·07

Even when allowance is made for the very severe infection it was subjected to, it will be seen that the variety was very bunt liable, as 77·43 per cent. of the plants which grew from infected but untreated seeds were bunty.

These results, though not regarded as final, confirm the opinion that the film of bluestone deposited by treatment with that substance acts as a protection against reinfection. Apparently, a solution of 1 : 50 is better for this purpose than the weaker solutions, but the fact that only 44 per cent. of plants grew from seed treated with the strong solution, indicates that it is possible to buy such protection at an excessive rate.

Formalin, it will be observed, affords only a very slight protection. This is only what would be expected from the character of this fungicide.

It will be observed that from the plot on which untreated and uninfected seed was planted one bunty plant was obtained. Every possible care was taken to prevent this seed from becoming infected, but the result shows how difficult it is to do this if smut spores are about. From this result, and from the results showing the number of bunty plants which were obtained from seed which had been treated but which had afterwards been infected, it will be seen how necessary it is to prevent treated seed from coming into contact with bags or implements which have held smutty grain and which have not been disinfected.

Section V.

Object :—To determine what effect, protective or otherwise, the different fungicides have upon the seed grain, when it is planted in ground too dry for the seed to germinate in, and which remains so for some time after the seed is planted.

Owing to the peculiarities of our climate it is sometimes necessary to plant seed in ground which is too dry for it to germinate in, and in consequence it has to lie dormant, in some cases for a considerable length of time. It is believed that bluestoned seed planted under such conditions is less liable to decay than is untreated seed; the opinion has also been advanced that formalin-treated seed rapidly loses its germinating power when planted in dry soil. To test the soundness or otherwise of these opinions, and also to ascertain the effect of planting seed treated with hot water in dry soil, was the reason for planning this experiment. It was impossible to plant this experiment in the field, for it was necessary that the soil should be kept without water for the period predetermined upon. Sun-dried soil was therefore collected from the surface of a paddock and placed in boxes. These boxes were kept under cover in an open shed so that the soil could absorb moisture from the air, but would be away from the direct influence of rain. The seeds, after being treated in accordance with the requirements of the experiment and then dried, were planted. It had been arranged that these boxes should be watered as follows :—

Box No. 1 immediately after planting.
,, 2 one month after planting.
,, 3 two months after planting.
,, 4 three months after planting.
,, 5 twelve months after planting.

Unfortunately, interference by mice with the seeds in three of the boxes, after they had been planted, prevented these arrangements being carried out, and led to the partial abandonment of the experiment.

Two boxes were watered 73 and 126 days, respectively, after planting. The results obtained, with other details, are shown in Table IX.

TABLE IX. SECTION V.

SHOWING the effect of planting Untreated and Treated Seeds in soil too dry for the seeds to germinate in.

Box No.	Variety.	Date watered.	Number of days in dry ground.	Untreated.		Hot-water, 132°—135° F.		Formalin, 1 : 400.		Bluestone, 2 %.		Bluestone, 1 %.	
				Seeds germinated.	% germinated.	Seeds germinated.	% killed by treatment.	Seeds germinated.	% killed by treatment.	Seeds germinated.	% killed by treatment.	Seeds germinated.	% killed by treatment.
		1906.											
3	Bobs	6 July	73	90	92·3	12	52·3	11	54·0	52	24·3	74	11·0
3	Cretan			94		49		52		72		87	
3	Federation			93		59		52		80		83	
5	Bobs	28 Aug.	126	100	97·2	37	47·0	35	56·6	59	26·6	71	15·3
5	Cretan			92		59		40		80		85	
5	Federation			100		55		47		73		90	

It will be seen that the seeds, after lying dormant in dry soil for four months were unimpaired, and, as far as such ground is concerned, there seems to be no need for a protective film of any kind.

These meagre results seem to confirm the opinion that formalin-treated seed does lose its vitality when planted in dry soil.

We desire to record our thanks to Mr. H. W. Potts, Principal of the Hawkesbury Agricultural College, who kindly arranged with Mr. Musson, the Botanist of that institution, to conduct laboratory tests with the seed residues from some of the plots. The results from the laboratory confirm those obtained in the field, and it is to be regretted that seed from all the plots was not available, so that this experiment could have been conducted in duplicate in the laboratory, and the results published.

Seasonable Notes.

GEO. L. SUTTON,
Wheat Experimentalist.

PREPARATIONS are now in order for the planting which is to take place during the coming season. Not the least important matter in connection with these is the treatment of the seed wheat for the prevention of stinking smut or bunt. This smut which *can* be prevented, should not be confused with loose or flying smut, which, as far as is at present known, *cannot* be prevented by any method of treating the seed. It is therefore unwise and unsafe to use for seed the grain from a crop in which loose smut was seen.

For the prevention of stinking smut the bluestone method still meets with most favour in this State. It is very effective, but when used alone, and not in conjunction with lime, it unnecessarily destroys the vitality of a very large quantity of the grain treated. The loss which takes place is unnecessary, because it can be almost entirely prevented by supplementing the bluestone treatment with one of lime in some form or other.

The loss throughout the State resulting from treating seed with bluestone without lime must be enormous. From experiments conducted this year at Cowra, the results of which are published in the current number of this *Gazette*, it is found, that, for every 100 bushels of seed-wheat treated with bluestone, about 18½ bushels do not produce plants; and, in addition to this loss, the plants produced by the treated seeds are less vigorous than those resulting from untreated seed. It is only reasonable to suppose that the yield from the less vigorous plants will not be as great as that from the others. Such a supposition is borne out by the actual yields which were obtained from small plots planted with treated and with untreated seed, and which confirm the results obtained in larger field trials carried out by Mr. Wyatt De Little of Temora station in 1905. The details very kindly supplied to me by that gentleman are as follows:—From 40 acres of Marshall's No. 3, the seed of which was bluestoned, 160 bags were obtained or at the rate of 4 bags per acre; from 12 acres of the same wheat, which was not bluestoned, planted in the same paddock, the field was 60 bags or 5 bags per acre. In another trial 1 acre sown with seed which was not bluestoned produced 3 bags; on an adjacent acre sown with bluestoned seed the field was 2½ bags. From these figures it will be seen that the loss is a real one, and from Mr. De Little's trials it ranges from 2 to 4 bushels per acre.

It must not for a moment be inferred that it is advisable to neglect treating the seed-grain. It is better, for obvious reasons, to raise a moderate crop free from smut, than a heavy one of smutted grain; such a performance however, is hardly possible, as smut invariably reduces the yield. Even if there were no less destructive treatment than that of bluestone without lime,

it would be preferable to adopt it rather than run the risk of producing smutted crops. It has been found that the loss referred to, can be almost entirely prevented, by using lime in conjunction with bluestone; the necessity therefore for using the combined treatment is at once apparent and cannot be too strongly emphasised. From the experiments previously referred to it is found that when treatment with lime supplements the use of bluestone, the heavy loss of 18½ bushels per 100 is reduced to the comparatively light one of 1½ bushels, and in addition to this the vigour of the plants is not materially interfered with. Such results as these more than compensate for the expenditure of the few pence and the little extra labour necessary when the combined method is adopted.

For those who use drills, the practice of dusting slaked lime over the bluestoned seed, is not as suitable as that of dipping it in lime-water, as the addition of the air-slaked lime makes the seed so that it will not run through the drill easily.

The lime-water used must be made by slaking *freshly-burnt* or *quick* lime in water. A mixture of air-slaked lime and water is not suitable. By slaking the quick lime as soon as obtained, and keeping the surface covered with water, the soft putty (hydrate of lime) can be used in place of the quick lime as required throughout the season.

It may be thought that if the seed be dipped in a mixture made of lime water and bluestone, the same good results will be obtained as by dipping it first in the solution of bluestone and afterwards in the lime-water. Such a plan is to be avoided, for, whilst the effect of the mixing is that the caustic action of the bluestone is neutralised and in consequence the vigour of the plants resulting from seed so treated is not interfered with, it is by no means certain that the mixture will accomplish the purpose desired, *i.e.*, destroy the smut spores on the seed, and prevent smut in the resulting crop.

The use of formalin for the prevention of smut is very slowly on the increase.

There seems to be reasonable grounds for believing that, when sown in dry soil, formalin-treated seed loses its vitality; on this account, farmers in our dry districts will do well to continue the bluestone-lime method until more evidence on this matter is forthcoming. In the moister districts formalin can be used with perfect safety and advantage, provided it is used with care and as directed. It is about as effective, and very much less destructive than the bluestone (without lime) treatment, and about equal to, and somewhat less troublesome than the bluestone-lime method.

Last year several cases of failure and faulty germination were reported as the result of using formalin-treated seed; but, on investigating these, it was found that they were due to using solutions which were too strong.

It seems difficult for farmers who have been accustomed to dealing with a relatively strong solution of bluestone, to realise that a weak solution of formalin and water, viz., formalin, 1 part, water, 400 parts, can be effective especially as the resulting mixture in appearance is not appreciably different from the water with which it is mixed.

A Suggestion.

Though the various methods adopted to produce crops free from smut, by treating the seed-grain, meet with success, they involve a considerable amount of trouble, especially where large areas are planted. By the adoption of a plan, whereby the seed for the main crops of the farm is specially raised, under conditions where stringent precautions are taken to prevent the re-infection of the seed with smut spores during planting, and the infection of the grain during harvest by the use of implements, which have harvested smutted crops, and which have not been disinfected, it is believed that fully 95 per cent. of the labour and money now spent for treating the seed-grain can be saved without increasing the risk of producing smutted crops. The advantages of such a plan as the one indicated appear so great that it is suggested that our farmers seriously consider the advisability of adopting it. On a farm, where, say 200 acres are cropped each year, it would mean, if such a plan were in operation, that instead of treating, say, 100 bushels of seed-wheat each year, only 2½ or 3 bushels would require to be treated.

This suggestion is submitted, for the consideration of practical men, with confidence that it will receive the amount of attention the importance of the subject warrants, and in accordance with the degree of merit the suggestion itself may possess.

In order to realise that such a plan has any merit, it is necessary to recollect that the object of treating seed-wheat to prevent smut, is to destroy any spores which may be present on it. If seed can be obtained which has no smut spores on it treatment with bluestone or any other fungicide is quite unnecessary.

To give effect to this suggestion it would be necessary each year to set aside for the purpose of growing seed, a plot one-thirtieth or one-fortieth of the area it is intended to plant the following year; that is, where 200 acres are to be cropped, the seed-plot would occupy 5 to 7 acres. Such a plot should be situated in the best of the ground cropped that year, it should receive the best possible cultivation, and being a comparatively small area, additional attention could be given it to keep it free from weeds. If the seed for this plot be treated in a thorough and efficient manner, and after its treatment re-infection be guarded against, the resulting crop will be free from smut, and if care be taken to prevent infection whilst the crop is being harvested, the grain can be used as seed for the main crops without any treatment.

There are difficulties in the way of the successful adoption of this plan, but to the farmer who realises the difficulties and risks to be encountered they are not serious ones. The most serious is the danger from infection from machinery. This can be guarded against by thoroughly swabbing the parts with a strong, say a 10 per cent., solution of formalin.

An additional advantage which the adoption of such a plan has, is that it affords the farmer a systematic method of regularly renewing his seed, thus preventing it running out. In addition to any other advantages it may possess, the plan of raising seed as suggested would be a decided improvement upon the general method now in vogue of taking it indiscriminately from the main crop.

The Agricultural Aspect of Primary Education.

Mr. H. W. Potts, Principal of the Hawkesbury Agricultural College, delivered the following address to the members of the Second Summer School on January 2nd:—

With the return of good seasons we hear the oft-repeated cry "Back to the soil." In response, we desire to aim at arousing a popular movement in settling an intelligent, healthy, and trained body of citizens on those vast untilled areas of land available in our State, to raise rural avocations from a condition of comparative drudgery to that of sturdy independence. It is a laudable ambition to stimulate and advance the true destiny of this great agricultural and pastoral country on economic and sound principles by rescuing the land from its existing and almost idle condition through a forward and fixed policy of occupation. We enjoy a climate full of limitless advantages. Such useful adjuncts to good farming as our soils, timbers, water, and natural grasses are essential to the success of closer settlement. The British have a world-wide reputation as colonisers, through their courage, perseverance, self-reliance, and resourcefulness, but the demands of an advanced civilisation insists as well on sound technical training. The great want in our rising generation is that of some stimulating bias towards the land. Until quite recently our national system of education developed a love for the clerical and academic side of life. Happily this is being altered, and in such manner as to admirably fit in with our Australian life. The necessary elasticity given in the curricula of our public schools affords our teachers excellent scope to accomplish this. In so far as our rural pursuits are affected, I may be permitted to congratulate you gentlemen present on your earnestness in being here to take a share in the work of developing and directing the aims and thoughts of our country population towards that most independent and progressive of all pursuits—"A life on the land."

To instil a regard for country work at that impressionable period in our primary schools, to arouse an affection for nature and nature's products, to unfold a world of endless attractions, is a duty we are facing with the country child. It is asserted, and with some sense of truth, that education is more highly prized by children and parents in the cities and urban districts. The sameness of the defunct curriculum for all sorts and conditions of pupils was largely responsible. The trend of it was to excite a desire for the avocations and excitement of city life, and depreciate the sympathy for rural environment. One writer tersely describes it as, "The child lives in one world and goes to school in another." The new curriculum should alter this, and it augurs well for its success to note the practical interest you are taking in its adoption. Many problems are ahead of us, but, with the united experience of those whose

association with country conditions is appreciated and valuable, we hope as teachers to formulate and evolve systematic training in the creation of mental powers and faculty in the child which will end in improving our national life. Furthermore, we are not likely to forget the true responsibility of the teacher in the formation of character. Home life and school education are more intimately brought into close relationship in the country in the concerns of every day life than in the city.

The practice of agriculture has changed of late years. It is assuming a more complex character. It is more highly diversified. Machinery is invading every branch, and with it applied science. The successful farmers and pastoralists of to-day need specific training, a wider knowledge and greater skill than their less fortunate predecessors. The question to ask is, "When should this technical form of education commence?" And we unhesitatingly reply, "In the primary school." Much, however, depends on the teacher's personality, enthusiasm, aptitude, and initiative. With our experience in the first Summer School we found no lack of such qualifications. In to-night's audience similar evidence is apparent. The spirit of the new education is being absorbed and assimilated. Surely it is a note of enthusiasm when a hundred teachers abandon their well-earned Christmas holidays to qualify and equip themselves with the requisite training to resolutely attack the demands of the new curriculum.

Nature study and elementary agriculture are subjects which must be taught in harmonious relationship to systematically encourage the habit of accurate observation—to vitalise the mental and reasoning powers of the child. All animate nature appeals to children when directed to it in a sympathetic and attractive form. By this early awakening we stimulate and bring into existence the child's love for country life and its avocations. Shakespeare reminds us there are "tongues in trees, books in the running brooks, sermons in stones, and good in everything." In your hands lies the power to create a lasting public sentiment and respect for farming operations, and thus become an unseen influence in our national prosperity. Professor C. Lloyd Morgan, the principal of University College, Bristol, stated in a recent paper on "Nature study in Elementary Education":—"I am so fully convinced of the supreme importance of training the faculties of observation and the habit of sensory alertness in the early plastic and impressionable period of childhood—I hold so strongly the belief in the desirability of cultivating the sensory memory and storing the mind with faithful images of natural objects and scenes—that I am disposed to claim for nature study a foremost place in the early stages of the education of all." What are we to understand by nature study? "A process by which simple natural objects acquire meaning." We may assuredly assume that nature study is the outcome of object teaching, the gradual growth of mental faculty, and the displacement of the old and detestable, mechanical memory method. It directs a child's mind towards the importance of the instructive love and study of nature. The principle of utility is effectually insinuated at this stage, and lends strength to a subsequent feeling of contentment with out-door studies and pursuits. The aims and purposes of a nature-

study course will be brought closely under your observation during the period of this Summer School by our Mr. Musson, who has with strenuous devotion spent a lifetime in the successful quest of educational ideals from a nature-study point of view. Nature study should not be associated with the systematic teaching of agriculture beyond the understanding of basic facts and principles of an elementary character. These govern and control agriculture. Subjects may be selected for nature study which have direct bearing on the every-day life and occupations of a farmer. Fruit trees, vegetables, food plants, the injurious or beneficial insects and birds, the domestic animals, the seasons, can all be drawn upon. Bailey, states "Every subject in which men are interested can be put into pedagogic form, and be a means of training the mind."

As our country schools become better organised, greater opportunities will be available to increase the subjects. These must be so designed and selected as to exert an influence in advancing our agriculture. So much has been added of late years to our knowledge of the chemistry and physics of the soil, farm engineering, the improvements in food plants and live stock, that innumerable subjects can be secured for school work and training.

The school garden and orchard affords an excellent medium for exciting a child's interest and arousing the faculty of observation. Many phases in rural pursuits will become pregnant with meaningful reflections, and even end in acquiring monetary influence. Take as a subject the familiar daily article of diet—milk. A school lesson disclosing its composition and physical characteristics, its functions as a food, its value as a commercial product in the form of milk, cream, skim milk, whey, butter, or cheese, the estimation of fat in milk and the cause of changes in its composition, renders the daily work in the dairy attractive, and provides an endless theme for intelligent research.

It is not desirable or intended to teach the various operations associated with agriculture in our public schools. The aim is to interest the child in subjects intimately connected with daily home and farm life, to direct the child's mind to them attractively, to lay the foundation of future training either on the farm or in the agricultural college, to unfold natural science and demonstrate its usefulness in its later application to the land, to supersede the distasteful and wearisome burdens of antiquated methods on the farm. The affairs of common life are now so intermixed with applied science that our teachers in country schools should in the best interests of their pupils be in constant and practical sympathy with this form of teaching. During your residence here you will be afforded the opportunity of inspecting and reading if desired the most suitable books relating to nature study, agriculture, and allied subjects. The establishment of a library in each country school may wisely occupy your attention. A sensible selection of books will assist in the movement we are endeavouring to advance through you. This should include the "Farmer's and Fruitgrower's Guide," also the monthly issue of the New South Wales *Agricultural Gazette*, and several other Departmental publications. I may also add that the country schoolmaster invariably exerts an influence in the purchase of books for the local School of Arts. In this he can lend

influential assistance. Less fiction and a more progressive class of farm literature would as a result adorn the bookshelves of those useful institutions.

Stock-raising and wool are leading features in occupying land, and in this there is scope for elementary training. A study of the domestic animal and how it affects man may well be taken up. A child should possess some ideal as to the merits of a thoroughbred in contrast with the average nondescript. As an incentive to the study of animals, the local Agricultural Society's annual show affords an excellent opportunity, and in fact facilities are now offered at shows for object lessons. The children might be encouraged to take an active interest in providing exhibits, and the best sent to the Royal Show in Sydney. The school museum might be provided with the best examples of grain and other produce from the district. Teachers will find enough material at the college lectures and demonstrations from which to work up entertaining and instructive lessons. The æsthetic surroundings of school and farm may be enhanced by the planting of shade and shelter belts of trees and hedges. Probably the most entertaining and effective introduction to the teaching of natural science is physiography, wherein observation plays the leading part. Huxley wrote:—"The attempt to convey scientific conceptions without the appeal to observation, which can only give such conception firmness and reality, appears to me to be in direct antagonism to the fundamental principles of scientific education."

In conclusion, gentlemen, let me state that there is nothing new in the proposal to assimilate primary with elementary education in agriculture. Such instruction has been given for years past in the primary schools of France, Belgium, Denmark, Germany, Ireland, England, Scotland, Canada, California, Minnesota, Nebraska, Wisconsin, and Alabama, where it has promoted industrial wealth. There is unlimited scope in our own State for its application. The official curriculum is now arranged to admit it, and it remains now with you, to give substantial effect to the new policy. Mr. True, the head of the Experiment Stations in the States, writes—"The education which the farmer needs is that which will give him some real appreciation of the progressive and scientific spirit of the age in which he lives, will arouse a keen interest in the facts and principles of science as related to his own vocation, will show him that in agriculture is an ample opportunity for lifelong studies which may refresh and delight the mind, as well as minister to material success, and in general will lift agricultural practice out of drudgery into the domain of intelligent and hopeful labour." This is our hope in Australia. Occasionally we hear disparaging remarks as to the lack of appreciation of modern methods by our farmers, their narrow conservatism and indifference, but such are wrong. All honour is due to our pioneers who have suffered isolation, who with stout hearts, industry, and extraordinary patience, have bravely made homes under the most adverse and discouraging circumstances. The dull routine of the untrained farmer must cease with his generation. It is our duty to see that his children are not deprived of refinement and culture, and are given that conception of advanced ideals which education alone can convey.

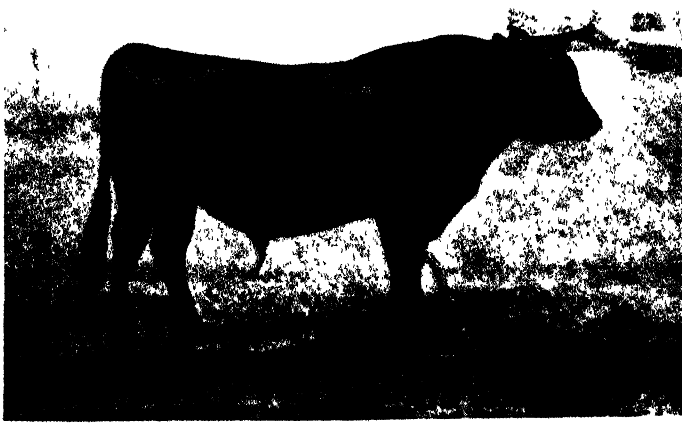
Dairying at Wagga Experimental Farm.

G. M. McKEOWN.

ALTHOUGH the Wagga Experimental Farm cannot be said to be situated in a dairying district, it has nevertheless been amply demonstrated that with a hardy breed of cattle, and by making provision for feed, dairying can be carried on with considerable success. The great drawback in a district such as this is the want of green feed during the summer and autumn. Maize does not succeed in this district unless irrigated, which is not possible at the farm; while sorghum, though it will grow under drier conditions than maize, cannot always be depended upon. The best standby is ensilage, made from the spring growths; and this is practised as far as possible to provide feed during the time the grass is dry.

Barley and vetches or peas sown in the autumn and made into silage in spring have given very satisfactory results as a fodder for use in the following summer and winter months.

During last spring and early summer about thirty cows and heifers were in milk. A tabulated return is given, showing the breed, period of lactation, and yield.



Jersey Bull, "Emperor," by Coral's Lad from Empress.

The breed depended on is pure Jersey, and, with few exceptions, all the cows are pure-bred—this breed having given the greatest satisfaction. Those having Ayrshire blood have shown themselves excellent milkers, and "good doers" in all seasons.

A number of the cows were on their first calf last spring, and notwithstanding that they are milked by students, and there is necessarily a frequent change of milkers, the yields are very satisfactory.

With the number of students who receive practical training on the farm the presence of a small herd of dairy cattle is of the greatest use for educative purposes, besides supplying the necessary milk and butter for officers' and students' quarters, and for the men employed in the institution.

When water from Barren Jack reservoir is available there will, no doubt, be a considerable amount of attention paid to dairying in this district, for with irrigation green feed will be easily grown, and large quantities of ensilage could be made throughout the year.

The country is sound and well-drained, thus a considerable area suitable for the most lucrative of agricultural industries will be added to the dairying districts of the State; but conservation of fodder is an absolute necessity, and knowing the general tendency to laxity in this matter it should be distinctly understood that success is only possible to those who recognise the need for proper provision for stock.

Students milking, Wagga Experimental Farm.

At present the dairy herd is being worked as a minor side issue, but the intention is to go in for dairying more thoroughly, now a herd of desirable cattle has been bred up. Although the period of lactation, owing to the dry pastures, cannot be expected to reach the records of more favoured dairying districts, still, by making every possible provision for the dry season by means of ensilage, lucerne, and other fodder, a very useful adjunct to the farm will be established, of immense value as an educative medium for the students and visitors.

The bulls used on the farm are Colleen's Golden Lad, by Melbourne (imp.) from Colleen (imp.), and Emperor, by Coral's Lad from Empress. Both bulls are bred from milking strains of a high class, and the heifers by the former are showing excellent records. Coral's Lad's stock are also of excellent milking quality. Emperor is a very handsome bull, of good constitution, and his stock are of very promising quality.

The idea aimed at in breeding this herd has been to build up one constitutionally strong, and therefore capable of withstanding the hard summer without falling away. In this, up to now, very great success has been achieved. The Jersey type has not been sacrificed in the slightest, as the illustration of the herd standing outside the milking-yard will show. Lately the tuberculin test was applied to the herd with satisfactory results in the case of every

Group of Jersey Cows outside milking yard.

animal bred on the farm. This was most satisfactory, and is additional evidence that where due care is exercised in the selection of typical cattle of sound constitution, a good healthy dairy herd suitable to the Riverina is soon bred up.

DAIRY CATTLE.

Milk yields from cows on last calving.

Name.	Breed.	Period.	Milk.
		weeks.	lb.
Cherry ... . Grade	Jersey	48	5,731
Jessie	Jersey-Ayrshire .	53	7,603
Iris	Jersey	51	6,329
Nellie	,, ...	46	5,361
Gertie	,, ...	56	6,071
Ranee } by Coral's Lad	,, ...	50	4,642
Grace } by Coral's Lad	,, ...	41	3,052
Dot } by Coral's Lad	,, ...	49	4,708
Daphne } by Coral's Lad	,, ...	62	6,369
Coral } by Coral's Lad	,, ...	37	3,003
Flirt } by Coral's Lad	,, ...	52	5,348
Elsie	,, ...	59	5,828
Spot ... ... Grade	,, ...	41	4,249
Nancy	,, ...	45	4,298
Thistle ... ... Grade	,, ...	44	5,229
Empress	,, ...	52	6,293
Phyllis (by Coral's Lad)	,, ...	53	5,616
Marjory (aged)	,, ...	36	3,952

DAIRY CATTLE—*continued.*

Young cows with first calf.

Name.		Breed.	Period.	Milk.
Myall	by Coral's Lad	Jersey	52	4,728
Fairy		,,	46	4,458
Elaine		,,	40	3,639
Moira		,,	36	3,266
Countess		,,	36	4,259
Hawthorn	by Colleen's Golden Lad	,,	11	2,193
Enid		,,	10	1,916
Wonga		,,	10	1,353
Wilga		,,	10	2,045
Joan		Jersey-Ayrshire	7	1,881
Doreen		Jersey	6	1,298
Clover		,,	6	1,092

EXPORT OF PORK TO ENGLAND. WARNING TO SHIPPERS.

THE Agent-General for New South Wales, London, has reported to the Honorable the Minister for Mines and Agriculture (Mr. S. W. Moore) that it is very necessary special attention should be given to the preparation of pork for export. He says if once a man is prosecuted and convicted in Great Britain for selling diseased pork from the Colonies, it will be a matter of great difficulty to find any future sales for it in Great Britain.

The Agent-General states that in December last a carcass of pork imported by a Colonial House in London was seized at Smithfield Market by the Corporation Sanitary Authorities and condemned as diseased. The disease was pleurisy and the pleura of the pig had been removed before shipment. Whenever this is done the carcass is always seized and condemned by the authorities. There was no information forthcoming as to the State of origin, as there was no label upon the carcass showing inspection had taken place, and the cloth had been taken off the carcass, and the mark was lost. The carcass was of poor quality. The penalties for exposing for sale diseased meat are very severe, ranging from heavy fines to imprisonment with hard labour, and this punishment would fall on the importer in the case of oversea meat should a prosecution and conviction take place. The Agent-General therefore wishes to accentuate the very great necessity there is for every care being taken when shipping pork so that no doubtful carcass be despatched.

Entomological Notes.

A FIGHT WITH CLIMBING CUT-WORMS (*Leucania unipuncta*) AT TAMWORTH.

WALTER W. FROGGATT, F.L.S.,
Government Entomologist.

ABOUT three years ago the caterpillars of the American Army Worm Moth (*Leucania unipuncta* Haw.), a cosmopolitan noctuid moth, the larvæ of which are popularly known in Australia as Climbing Cutworms, was reported as a pest all over the eastern portion of the Continent, from Gippsland in the south of Victoria to the Darling Downs in Queensland. Though several well-known species, such as the Bugong Moth (*Agrotis infusa*), have been known for many years in New South Wales as serious pests in the caterpillar state to grass, lucerne, and green-growing crops, it was not until the 1903-4 invasion that this particular species of Army Worm was identified; it appeared in such numbers as to constitute a much more serious pest than all the others. First in Singleton, among wheat, and later on at Tamworth, among the English barley, they appeared in countless millions. The loss in the Tamworth district alone was estimated by Mr. C. Jefferies Britten as over 20,000 bags of barley; he, himself, lost fully 6,000 bags, practically the whole of a magnificent crop.

After this experience Mr. Britten was determined to keep ahead of these pests, so that ever since he has, on the advance of spring, kept a sharp lookout for the first indication of these caterpillars. Slight invasions of them appeared once or twice, but not enough to do any damage; but about 25th August, 1906, caterpillars were reported to be appearing in the flats about Tamworth, where they did some damage to the young grass and lucerne. I spent a few days in the district, and found that they were the caterpillars of the Bugong Moth and not the dreaded Army Worm.

The Army Worm, however, appeared, according to Mr. Britten's notes. on the 13th of September, when they were found just hatching out in the centre of a 170-acre paddock of barley. Poisoning with Paris green, with the usual formula of 1 oz. of Paris green to 1 lb. of bran and 1 oz. of sugar, was commenced at once. At first we met with little success, probably because the grubs were very small and the green flag of the barley and weeds upon the ground was very abundant. When the grubs were much more advanced in size they ate the poison readily, and within ten days of sowing the poisoned bran it was hard to find a live caterpillar, though the severed heads of barley lying on the ground showed

where they had been. Mr. Britten estimates that about 2 bushels to the acre were destroyed in this manner.

From this date (13th September) until early in October, this was the only paddock affected. However, on the 15th of October, I received an urgent note from Mr. Britten and some specimens of the Army Worm caterpillars. He stated that he believed every paddock was infested with them. In several of the paddocks they were swarming on the ground and climbing all over the flag.

When I reached Tamworth a few days later they were even more in evidence, and poisoning was in full swing. In their habits the caterpillars acted in exactly the same manner as they did in the first invasion: they first feed upon the flag, and were most numerous in the thickest part of the crop, or sheltered under barley that had been broken down by the rain and wind. As the flag dries off or is devoured, the main stalk of the barley plant changes from green to rich yellow, the last bit of green being well defined just below the barley head. This is where the Climbing Cutworm invariably rests while gnawing the stalk through; the head then falls to the ground where it is sometimes attacked by the caterpillars, but just as often left where it fell. Sometimes the cutworms nibble off all the beard of the barley head before they cut it off; but this is usually when the ears are very green.

Mr. James Britten, who was in charge of operations, took me round the infested paddocks, in which the barley was just turning into a rich golden tint in the ears. I noticed that though a few of the almost mature caterpillars were resting, extended to their full length, along the upper leaves or flag upon which they had been feeding during the previous night, the rest of them were upon the ground hidden under the base of the stools; here they remained usually all through the heat of the day, coming out to feed about 4 o'clock in the afternoon, and then feeding on right through the night.

At the time I reached the scene of action it was the critical time of the barley fields—a race between the ripening barley and the caterpillars. If the barley had ripened so that all the ear-stalks had been dry and yellow before the caterpillars had eaten off the flag and climbed up, they might have left the heads alone; but the greener the crop the greater the danger, for the ground below was literally alive with caterpillars in all stages of size and development.

Next morning we set to work making up poisoned bran. With his characteristic energy Mr. C. Jefferies Britten put all hands on to work, and an unlimited supply of material. "As long as we beat the brutes," he said, "I don't care what it costs." The bran was brought up in bags, weighed, and 1 lb. of Paris green added to every 16 lb. of bran. The bran, after being weighed, was poured out on large bag sheets, the Paris green scattered through it, and two men with long-handled shovels mixed it up thoroughly. When the whole was of a delicate green tint, water was added from a hogshead, in which about half a bucket of salt had been

added, so that it just had a salty taste. The first lot of poisoned bait used before I arrived had been flavoured in a similar manner with sugar. This had a hardening effect upon any bait remaining over till the next day, so I substituted salt, with every good results; the caterpillars seemed to eat it more readily, and the food remained moist at night. Enough water was added to wet all the material, which was again mixed up by the shovel men until it was like a bran mash, and would crumble readily through our hands. Each heap consisted of a quarter of a bag of bran, and the bait was placed in about bushel lots. When six bags of bran were made up, we ran it out in a cart about 4 o'clock in the afternoon, to the paddock to be poisoned, and the bags were deposited at regular intervals along the headlands. At first it was sowed by men on foot, broadcasting it as they walked in line down the furrows; and as the crops had been all drilled in, very little of the barley was knocked down. Though, at first, some of the bait may have been wasted, the men soon used their judgment in spreading it very lightly where the crop was open and dry, while scattering it thickly in the denser parts of the field, particularly where some of the crop had been laid down by the storms, and under which the caterpillars were always most numerous.

This was the method practised in distributing the poisoned bait while I was at the farm; but later on, Mr. Britten mounted his men on horseback with a box containing the bait strapped on in front of the rider. He writes:—"We found that two men (while not doing the crop any more harm) could spread as much as twelve men on foot, and keep three men constantly mixing bran. After the first evening's poisoning we were up early next morning to see the results, and found caterpillars of all shapes and sizes lying dead, round every stool of barley; most of the dead ones were fully extended, and not curled up as in life. If you touched one with any life in it, it immediately contracted its body and curled round; but many of these were apparently very sick. On Sunday morning (21st October) it was very hot, but for some reason the caterpillars were moving across the road between two paddocks as early as 10 o'clock, and though not going in any particular direction, we experimented by cutting furrows between the two fields to try and check their advance. In each of these furrows, pot-holes, about 20 inches deep, were sunk at intervals of 30 feet; as the caterpillars managed to cross them, bags of engine soot were strewn along the outer edge; but in spite of these obstructions many of them managed to overcome all obstacles, and scores of dusty caterpillars could be seen crossing the lines. Siftings, wet with kerosene, were a much more effective barrier; but as the caterpillars wandered round in all directions the barrier system was abandoned, and poisoning carried on as before. It was evident that the Climbing Cutworms were very much more active than the ordinary Bugong Moth grubs; and even if they had all been travelling in the same direction, I doubt if we could have stopped them by the barrier system alone."

Mr. Britten has furnished me with the following account of the cost of fighting the Climbing Cutworms, at Woodside, last October, which is as follows:—

	£	s.	d.
7 cwt. of Paris green, @ 1s. 2d. per lb.	45	14	8
5½ tons of bran, @ £3 3s. 4d. per ton	17	8	4
Salt	3	0	0
Sugar	6	0	0
Labour (rations not counted)	15	7	4
	£87	10	4

In all, 1,070 acres were treated with poisoned bran; and though the expense may seem considerable and beyond the power of a small grower, Mr. Britten is convinced that if he had not taken these prompt measures to deal with these pests in a wholesale manner, he would have lost the greater part of all his English barley, as he did in 1903, when a very similar crop was totally destroyed by these cutworms. The yield from this acreage was 32,000 bushels of barley. Mr. Britten estimates that if he had not acted promptly, he would have lost at least three-quarters of the total yield, as it was, he only lost from 3 to 4 bushels per acre.

In conclusion, I would like to point out that this is probably the largest practical experiment in successfully destroying cutworms ever carried out by a farmer and entomologist, and is a great triumph in the annals of economic entomology in Australia.

The Influence of Bees on Crops.

ALBERT GALE.

"You have a splendid crop, thank God!" was once said at a harvest supper in the Old Country. "What do you thank God for?" was the reply; "didn't I put plenty of manure in the ground?" If we were to put the question, "What are the chief necessaries in the production of your crops?" to all the agricultural societies in the States, many of them would probably answer, "Deep and frequent ploughing, the loosening of the soil, keeping the surface well open, judicious manuring, good seed, freedom from weeds, and favourable seasons." No matter what branch of soil-culture an individual may be engaged in, or what crops he is growing, if he be market gardener, agriculturist, florist, or orchardist, the answer, perhaps not in as many words, would be tantamount to the same. The florist and orchardist would add pruning to their catalogue of the necessary requirements. There are tiny agents employed by Nature that dwarf into utter insignificance all the modern implements of husbandry that are in use to ensure "an abundant and heavy harvest." They are seldom taken into account. These tiny agents are an absolute and concomitant necessity for the production of a crop from any member of the vegetable kingdom. The wind and insects are the agents employed for the fertilisation of crops. The two mentioned are the chief, but there are many others of a subordinate chartcter that Nature frequently enlists to aid in the reproduction of the various members of her plant life. The members of Nature's great vegetable army, in regard to their method of reproduciton, have two distinct characteristics by means of which they perpetuate their species and varieties, *i.e.*, some are termed flowerless and others flowering plants—*cryptogamic* and *phanerogamic* respectively. Ferns, mosses, seaweeds, &c., are included in the former, but this article has nothing to do with the reproduction of these cryptogamic plants.

Flowering plants, "the herb yielding seed and the fruit-tree yielding fruit after its kind, whose seed is in itself," are the portions of the subject I wish to deal with. How herbs yield seed, and how fruit-trees yield fruit, appears strange, if we take into consideration the too frequent destruction of the very many agents, more especially the honey bee, that husbandmen in their blind ignorance are constantly waging war upon. "Smear the trees with poisoned honey," "Destroy the bees of the bee-farmer," or "Burn down the tree where there are bee nests," is the too constant advice given by well-educated fruit-growers, but whose knowledge of bee life is far below zero. Nature has been very lavishing in the distribution of her varieties of indispensable helpmates for the

land culturists. The tiller of the soil, after the necessary preparation of the land and all the mechanical aids he brings to bear in assisting the earth to yield her increase, and to produce her crops of cereals, vegetables, and fruits for our imperative use, is solely dependent on outside agents, over one of which he has little or no control. I refer to the wind. In insect agency—of these the principal ones are members of the bee family—he can to a certain extent regulate the supply and demand.

The chief agent employed in the fertilisation of the seed that supplies us with the "staff of life" is the wind. Seeds that are so fertilised are termed anemophilus. But life's luxuries—cherries, plums, and other drupes or stone-fruit generally—are fertilised by insects; so are the pomes and all apple-like fruits, citrus fruits, berries, &c. Insects make the labours of the fruit-grower a great certainty—make "assurance doubly sure." Without them all his labours would end in a wretched and miserable failure. We are entirely dependent on insects for the fertilisation of our fruit. Seeds or fruits that are thus dependent on insects for reproduction are termed entomophilus. It is a true and wise saying, "No bees, no fruit." Nothing can be more fallacious than the idea that bees injure crops. There is no more widely entertained opinion amongst fruit-growers and florists than this. Let a fruit differ somewhat in form, tint, flavour, or general appearance from that of the same crop on the same tree, the innocent bee is accredited with having "inoculated" that particular member of the fruit of that tree. I have heard it said, when examining the fruit on a naval orange tree, where the characteristic mark in some of the fruit was very prominent and in others almost inconspicuous, that the latter was caused by *bees;* and this, too, from men of prominent positions in the agricultural world. If an ornamental flowering plant produce a bloom differing somewhat from the rest of its kind, or sport, the bee is said to be the culprit.

Jam-makers, during preserving seasons, very frequently when the bees come to clean up the waste syrup, and perhaps steal a little from that not found in the waste tub, cause, by means of boiling water, the destruction of millions of these tiny and industrious workers. Men do not understand that if they were to carry out this slaughter of the innocents with too high a hand, they would have little or no fruit to presrve. It may be interjected that butterflies, moths, beetles, and other members of the insect world fertilise our fruit crops as well as the bee family. True; but they leave behind them whole armies—well-drilled armies—of caterpilllars, grubs, or maggots. These destroy the very fruit their parents fertilised, defoliate the trees, cause sickness inducing disease, and ultimately the destruction of the orchard. This cannot be said of the bee. Butterflies, &c., fly from tree to tree and orchard to orchard, laying a few eggs here and a few there. It is difficult to confine or introduce them to a district, and when once there it is a greater difficulty still to exterminate them. Insect fertilisers, other than bees, are nearly all solitary and houseless wanderers, and it is a work of patience and labour to

mitigate their ravages, and the little good they may do as fertilisers is greatly counterbalanced by the great mischief wrought by their offspring. On the other hand, bees are social, are domestic, are under control, can be increased or diminished according to requirements.

The advent of a bee-keeper in a fruit-growing district is not a blessing in disguise, but a blessing so prominent that a traveller passing through a fruit district by express train during fruit harvest can always see the handiwork of the bee. The orchardist cultivates the trees from which the bees get their pollen and the bee-keeper his honey harvest, and the fruit-grower in his turn is almost entirely dependent on the bee-keper for his harvest of fruit. Between bee-keepers, fruit-growers, florists, &c., there is a mutual provident association so strongly united that to repress the former is to destroy the profits of the latter.

Another interjection: "Have not the bees been the chief agents in the destruction of some of the best varieties of melons, pumpkins, cucumbers, and other members of *Cucurbitaceæ* or gourd order that have been introduced into the State?" If by this it is meant that certain varieties of these very useful vegetables have entirely disappeared, and have been replaced by inferior ones, the result of cross-pollenisation, the bee for a while must plead guilty, because the whole of the order *Cucurbitaceæ* is entomophilous, and the bee plays the chief part in the cross-pollenisation. The fertilisation of the whole of the gourd order is so easily controlled that the bee must be acquitted, although he has pleaded guilty, on the ground that the growers have wholly contributed to the result by their indolence, carelessness, or ignorance. A little ignorance in these matters is far more dangerous than the proverbial little knowledge.

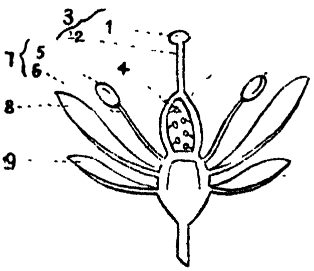
The essential organs of plant-life—that is to say, those organs wholly contributing to reproduction—are so prominent in the larger type of blossoms, such as pumpkins, fuchsias, the flowers of most fruit-trees, maize, &c., they can be seen with the naked eye and their functions easily demonstrated by or to anyone having the "observing eye." There is no necessity for a costly set of microscopic appliances, nor scientifically fitted-up laboratories, nor years of apprenticeship "to boot" to become an expert in the use Nature makes of the essential organs of flowers. The primary function of flowers, and, indeed, the only use flowers or blossoms are to the trees that bear them, is that of reproducing or perpetuating its species. The most essential parts of a flower are the stamens and pistil. These essential organs are most vigorous, healthy, and free from blemish in the earlier parts of the day. Just after the corolla bursts these unfurl, the anthers become distributive—*i.e.*, the pollen they contain is sufficiently matured to be wafted by the wind, or gathered by insects or other agencies for fertilising purposes—and later the stigma becomes receptive. The atmosphere during these early hours, in spring time, as a rule, is characterised by a dead calmness, or at the most by gentle breezes. This calmness is most beneficial, and is a highly necessary agent in ensuring

successfully the fructification of entomophilous fruits. The more frequently the bees trip to and fro from home to orchard and orchard to home, the greater and better are the results that follow their labours.

I have used the terms bloom, flower, and blossom indiscriminately. They are synonymous. The two former are generally applied to the flowers on ornamental plants, and the last to fruit-trees.

To understand how the all-important work of fertilisation is carried on by bees and other insects, it will be necessary to glance over the accompanying diagram, and have a slight knowledge of the functions each portion of a bloom has to perform.

The pistil (3), Diagram I, is divided into ovary (4), style (2), and stigma (1). The stigma is the end of the style turned inside out. It has four very peculiar characteristics: First, it is skinless; secondly, it is adhesive—if it be applied to down or a light feather it will adhere to it; thirdly, it is porous; and in the fourth place, it is covered with a lot of hair-like hooklets. These peculiarities in the stigma form important parts in the economy of fertilisation, taken in conjunction with the offices performed by bees in relation to fruit and the reproduction of plant-life. The style is traversed internally by a canal forming a tube, which is the connecting link between the stigma with the ovary.



.—1, Stigma. 2, Style. 4, Ovary. 1, 2, and 4 combined form 3, Pistil, or the female portion of the flower. 5, Anther. 6, Filament. 5 and 6 combined form 7, Stamens, or the male portion of the flower. 8, Corolla. 9, Calyx. 8 and 9 are the floral envelopes, and are for the protection of the Pistil and Stamens.

In this diagram the ovary (4) is said to be *superior*—that is, above or within the parts 8 or 9. Whilst the blossom is in bud-form it is enveloped by the corolla and calyx, and cannot be seen until these parts are mature or fall.

The stamens are the masculine reproductive organs, and, like the pistil, different portions of it receive different terms—the anthers (5) and filaments (6). The filaments are thread-like appendages, and are generally attached to the base of the corolla, and not to the ovary, as in the case of the style; neither is it tubular. Their office is to support the anthers, and to keep them in their proper position. The anthers, generally two in number, are situated at the summit of each filament. They are of different forms, according to the class of fruit borne by the tree—round, angular, elongated, or sometimes twisted. When the blossom first opens, the anther is usually of a bright colour, generally yellow. Its upper surface is a flat, smooth disc. As the day advances, and the anther matures, each one opens with a longitudinal slit its entire length. It can then be seen that each anther is a pocket or sack filled with pollen—a very fine dust-like flour. Pollen is of a variety of colours—white, red, pea-green, &c., are of frequent occurrence—but the predominating colour is

some shade of orange. By watching at the entrance of a bee-hive, different bees will be seen to enter with pollen of various shades, although they prefer to work on those blooms that are yielding the greatest quantity. By taking a piece of honeycomb containing bee-bread, and cutting a cell filled with it longitudinally, strata of various colours are always to be seen. In flowers that are fertilised by insects, the pollen is usually of a sticky nature. This property is availed of by the bees. By this they knead it into small pellets, and neatly pack it in the pollen baskets on their hinder legs. The pollen of pumpkins and other members of that family, on account of its non-adhesive quality, they cannot so treat, but carry home in the hairs of their bodies. The pollen of blossoms fertilised by the wind is also non-adhesive. Pollen grains are of various forms, according to the class of plant it is taken from.

(*To be continued.*)

"Bobs" Wheat.

There is, unfortunately, every reason to believe that a wheat of inferior milling character is being cultivated by some farmers under the name of "Bobs." The real Bobs is an excellent milling wheat, and is in great request by millers who have had an opportunity of testing the genuine variety. The late Mr. Farrer had reason to believe that a spurious Bobs was being grown in the Bathurst district, and communicated this doubt as to the genuineness of some wheats grown under that name to Mr. Sutton; since when, Mr. Sutton has had experience of a spurious Bobs being submitted to millers as recently as the beginning of last month. It is most important that only pure seed should be grown. It is therefore recommended that farmers who have any doubt as to the pureness of the variety they are cultivating as Bobs should obtain seed from the Department. The fact that there have been some contradictory reports regarding this excellent wheat may be attributable to the fact that there is a spurious Bobs on the market.

Weather Conditions during January, 1907.

A. NOBLE,
Officer-in-Charge, Meteorological Department.

HEAT steadily accumulated over the interior parts of Australia till January 5, when an annular or closed-curve depression formed over Western Victoria. On this date high temperatures were registered generally over our State. These were brought from the north-west on the front side of the depression and swept right across our State. As the centre of the disturbance passed our coast line on the following morning the rear circulation brought up strong southerly winds, which persisted in our coastal parts till January 19. Meantime monsoonal conditions brought some very heavy and continued rainfall over the northern parts of the State, especially over the upper tributaries of the Barwon River. Some very heavy thunderstorms with hail accompanied this disturbance. On January 14 Edgeroi Station, vicinity of Narrabri, reported over 3 inches rain following within half-hour, accompanied by hailstones as large as hen's eggs.

On the 24th one of the best rainstorms on record commenced on the northern parts of our State and slowly extended southwards, eventually covering the whole of the State. This storm apparently derived considerable energy from another closed-curve depression, which formed over the tropics, just south of the Gulf of Carpentaria, early on the morning of the 25th and moved southwards. At 9 a.m. on the 26th it fully controlled the weather in our State. Unfortunately data on the following day, Sunday, are only available for New South Wales coast stations, but, judging by the sudden fall in the barometer at Sydney, *i.e.*, from 29·88 at 9 a.m. on Saturday to 29·49 at 8·30 p.m. on Sunday, and also by the strong north-east winds and rough seas prevailing on our coast on the latter day, the rainstorm seems to have developed a very steep vortex over our inland districts on the Sunday, while the sudden veering of the wind to southerly on the coast early on Monday shows that the centre of the disturbance travelled out seawards, probably south of the latitude of Sydney, early on Monday morning. Finer conditions held sway generally over the State after this till the close of the month.

Taking the month as a whole the rainfall distribution may be classed as one of the best on record. The falls have been above normal over the northern half of the State, also over central parts and on coastal districts south of Jervis Bay. Prior to the last rainstorm the drought-affected region in the coastal districts extended from the Manning River to the Victorian border, probably the worst-affected part being the Illawarra districts. Now the whole of this region has been relieved, although some parts, especially around Windsor and Campbelltown, will require a good deal more rain yet before the ground

is sufficiently soaked. Out in the far southern part of the western division and also over Riverina the registrations were generally below normal, while Wentworth had no rain. In the north-west the falls were abundant, as the following table shows.

Comparative statement, showing total rainfall for January, 1907, and average annual rainfall:—

Station.	January, 1907.	Average Annual.
Hungerford	5·05	12·28
Wanaaring	8·37	11·62
Barringun	6·25	15·02
Tibooburra	4·07	7·54
Bourke	5·80	15·29
Louth	8·63	13·17
Tilpa	4·54	10·76
Brewarrina	9·26	16·50
Gongolgon	6·03	16·35
Girilambone	6·26	16·29

COMPARISON WITH INDIA.

A cablegram just received from India shows briefly the weather conditions over that country for the month just ended. These elements, together with those for our own State, Adelaide (S.A.), and Perth (W.A.), placed alongside for comparison appear in the following statement:—

	Departure from normal.		General Conditions (referring to State as a whole).
	Pressure.	Temperature.	
India	- ·03	+ 1·5	Dry.
Sydney (N.S.W.)	- ·03	+ 0·2	Wet.
Adelaide (S.A.)	·00	- 3·3	Dry.
Perth (W.A.)	- ·01	+ 1·5	——

If we eliminate the values for Adelaide and compare the remaining data one is again struck by the fact that pressure and temperature conditions were apparently much the same over both these widely separated regions, pressure being in defect while temperature was in excess.

Cherries at the Wagga Experimental Farm Orchard.

W. J. ALLEN.

No. 1. Schmidt's Bigarreau.

FLESH dark, medium firm; tree upright, spreading, fairly vigorous; fairly good cropper. Fruit of good quality, but does not bear heavily enough to warrant recommending it for market purposes.

No. 2. Bedford's Prolific.

Flesh dark; tree upright and strong; good crop. Fruit although rather soft carries well and is suitable for market purposes.

No. 3. St. Margaret.

This is one of the finest dark cherries under cultivation. It does well in most districts and has very firm flesh. A good shipper. Like almost all other cherries it thrives best on a good loamy soil which is fairly well drained.

No. 4. Tally Ho.

Flesh dark, rather soft; tree strong growing; heavy crop. Nothing to recommend it.

No. 5. Unnamed Variety.

Flesh dark, firm; light crop; sells well.

No. 6. Bigarreau Coluret.

Flesh dark; medium strong tree; heavy crop. Apparently not true to name, but a good variety and may be recommended on that score.

No. 7. Reine Hortense.

Flesh light, rather soft; good cropper; tree, strong spreading growth. Fruit too soft for market.

No. 8. Harrison's Heart.

Flesh light, firm; regular cropper; tree, weakly; good canning variety. Not unlike Florence.

No. 9. Florence.

This is a well-known variety which does well in some places, particularly on good deep soil. Flesh very firm; a good late market and canning variety.

No. 10. Bigarreau Napoleon.

Light flesh, soft; heavy cropper; rather a bad carrier as it shows bruises so easily. If picked before it is very ripe one of the best light cherries for canning.

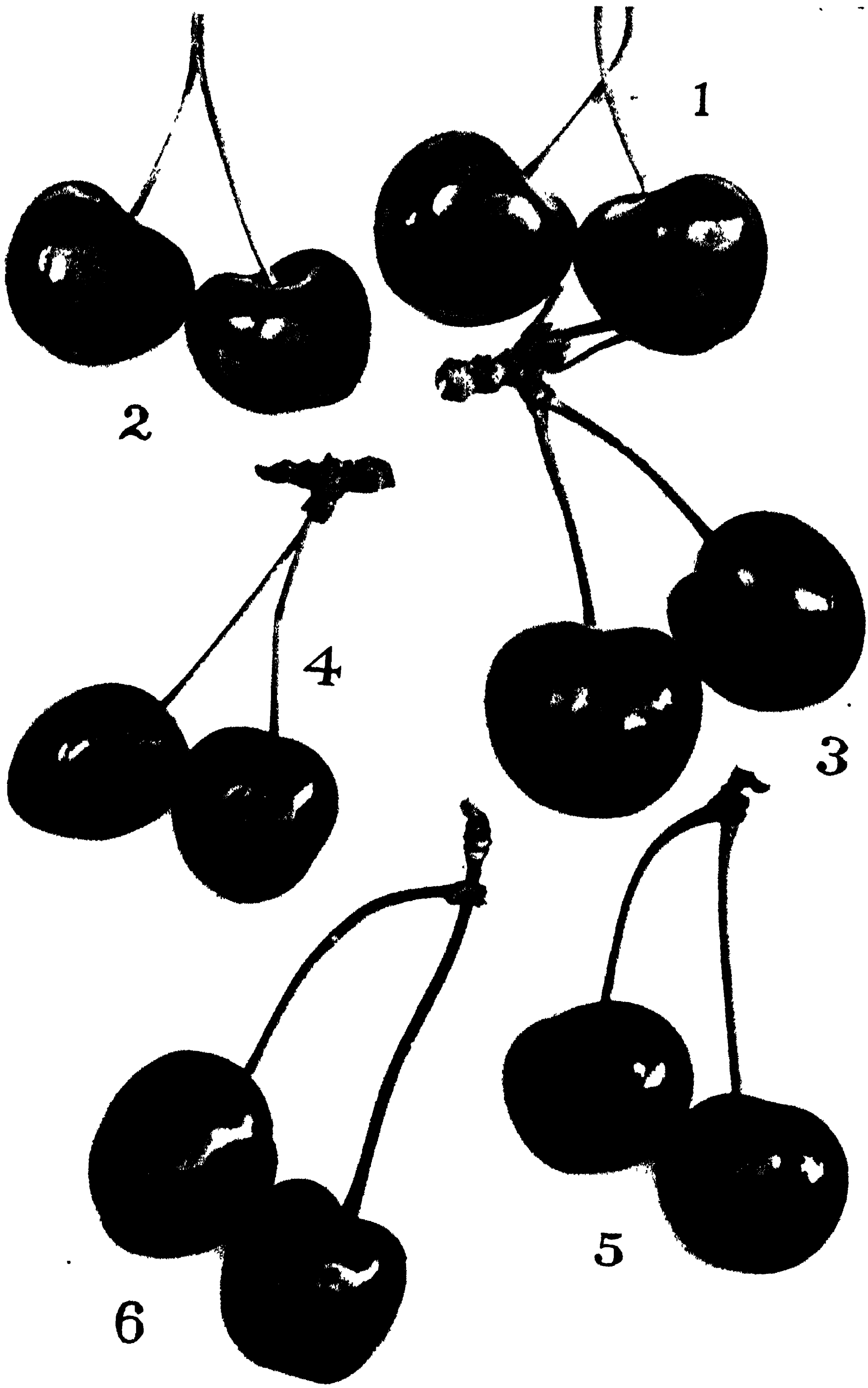
No. 11. Black Republican.

Flesh dark, firm; good cropper and a medium strong grower, but cannot be recommended here.

No. 12. Windsor.

Flesh light; regular cropper; medium strong growing tree; fruit inclined to be bitter.

We can recommend for districts similar to Wagga Nos. 2, 3, 6, and 9.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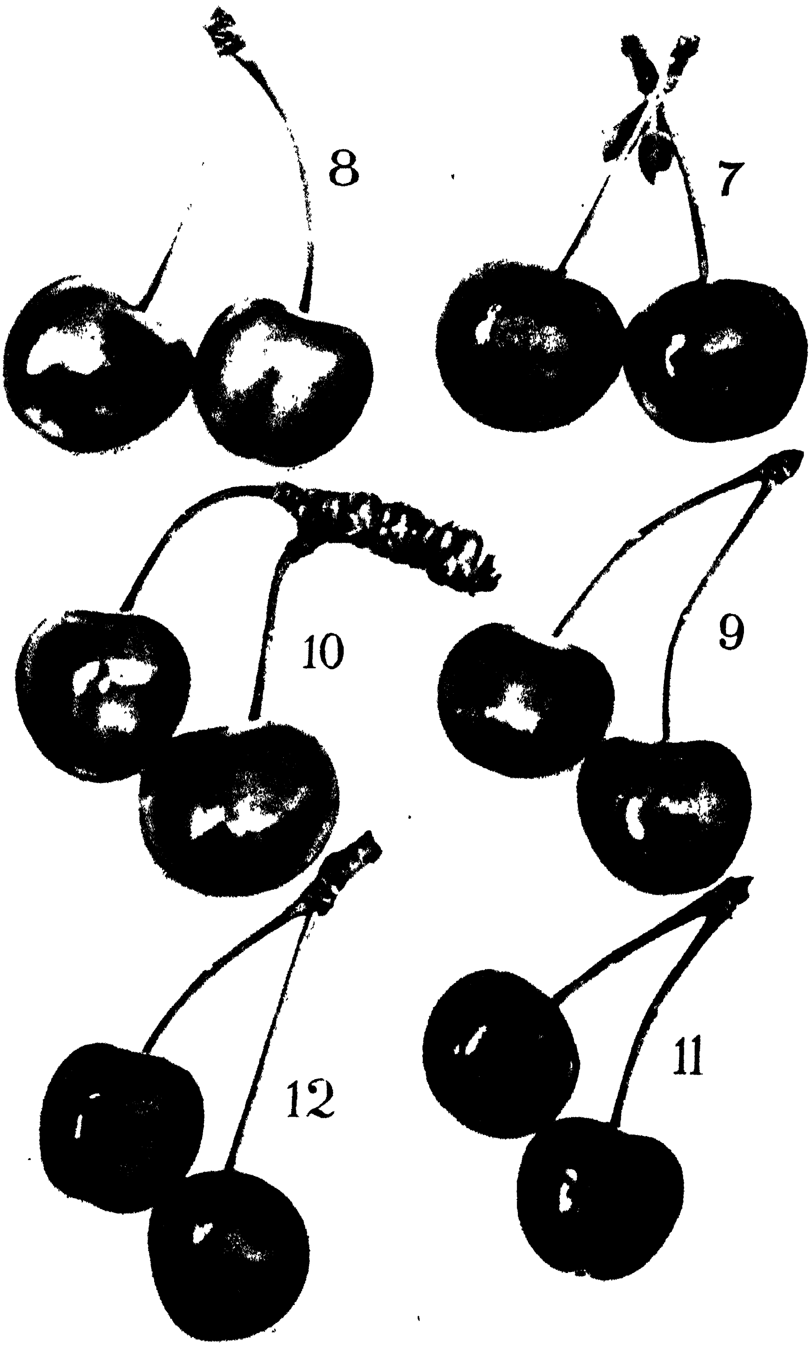


Orchard Notes.

W. J. ALLEN.

MARCH.

Citrus Trees.—Orchards in which the trees are in strong condition may be either sprayed or fumigated for the destruction of Red and other scales, some time during this month. If the work is properly carried out, the trees and fruit can be practically cleared of these pests. The fumigating should be done on cool, cloudy days, or at night, and the operator should avoid treating them on hot days or in wet weather, and under no circumstances should trees be fumigated if they have been sprayed with Bordeaux mixture during the spring or summer, as the effect would be very disastrous to the trees. If spraying is the means adopted for cleaning the trees, it will be found necessary to give several applications in order to destroy all the scales on trees and fruit.

Green Manuring.—The orchardist must bear in mind that this is the month for sowing Black tares, Grey field-peas, or any other crop which it is intended to plough under in the spring, and the earlier they are put in now the better. It will be found advisable to sow with such seeds about 80 lb. of superphosphates where the soil is in fair condition, and more than that quantity where it is very poor.

To those who are in doubt as to whether or not it pays to apply a little manure to the land at the time of sowing the seeds, I would say to leave an occasional drill or two unmanured in places, and the result will be so convincing that no doubt will exist at time of future sowings.

Picking, Grading, and Marketing Apples and Pears.—As these crops are heavy ones this year, a little more care in the marketing of same will be required; therefore, see that all fruit is carefully picked, so as not to bruise it; grade it evenly, then pack it nicely in bushel cases, so that when it is opened up on the markets it will present an attractive appearance. Market all those varieties first which are not good keepers, and I would offer a word of advice to growers not to rush all their fruit on the market at once for fear of a glut; at the same time, so long as these fruits are bringing good prices it may be well to dispose of them without too much delay, as the later fruits will have to compete with the Tasmanian apples and pears, which often arrive in Sydney at the rate of from twenty to thirty thousand cases per week.

Storing Apples.—In our cooler districts it is not a very difficult process to store some of our good keeping varieties in cool rooms—in fact, I have seen them picked, then put into old cases of any size, covered up, stacked underneath the trees, and in this simple, rough way kept for months in

the Batlow district. At Bathurst we have kept apples for months by simply storing them on trays on shelves; also stored in bushel cases and stacked away in our packing-house.

Exporting.—It is our intention to send about a thousand cases to London again this season, to test their carrying quality. Up to the present we have not succeeded in securing space for trial shipments to China, Japan, and California, but we are prepared to try these markets if space can be secured.

If intended for export, the fruit should be picked in the cool of the day or on cool days, and not allowed to stand in the sun, but should be kept in the shade of the tree until it is carted to the packing-house, and here, also, it should be kept as cool as possible until it is packed and ready for shipping; in fact, the secret of success lies in careful handling, honest packing, and keeping the fruit at as low a temperature as possible from the time it is taken from the tree until it reaches the consumer. Never, by any chance, should it be allowed to stand in the blazing sun at any time, nor to be over-ripe before being picked.

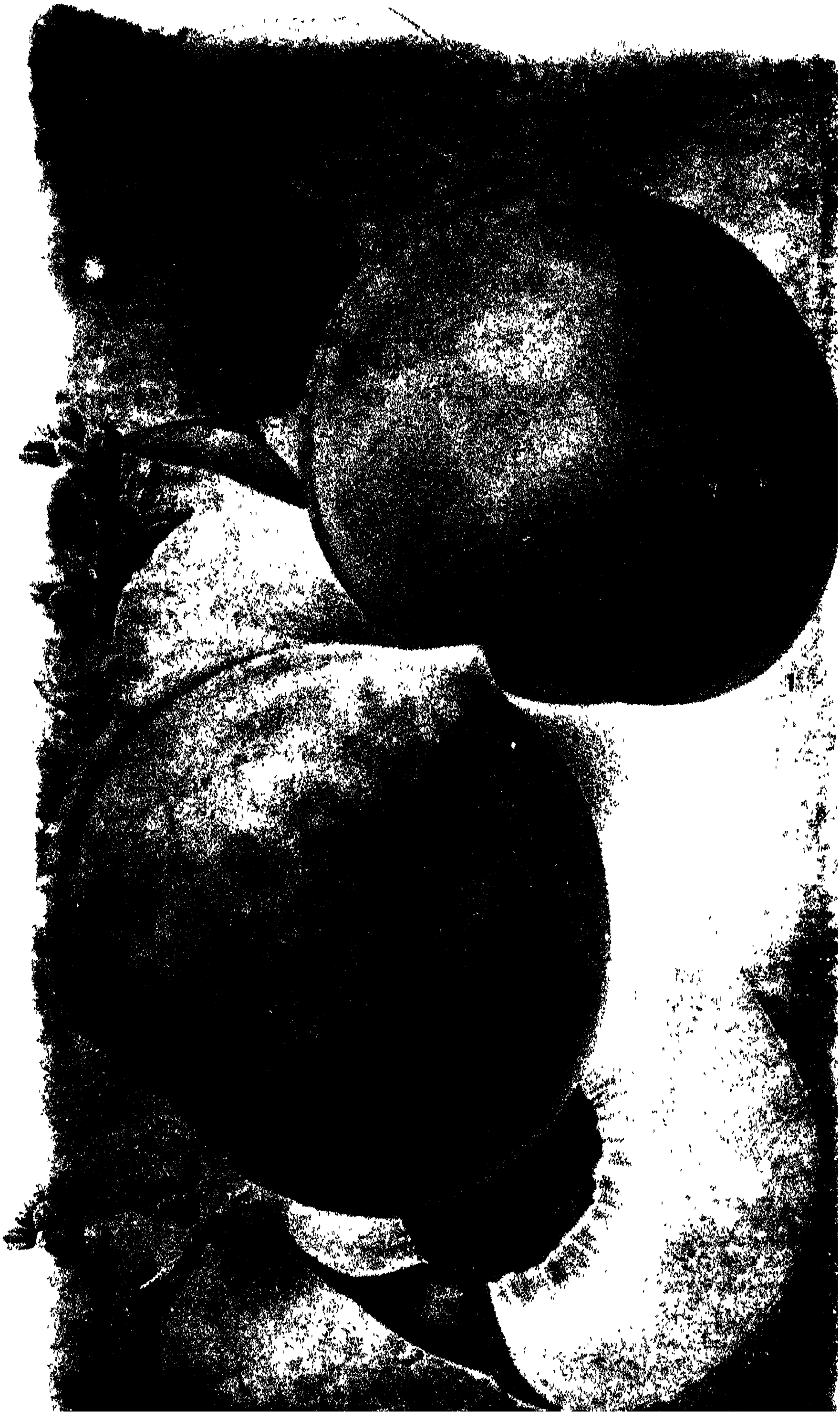
Generally, when the seeds are well coloured, it is ready to pick, and if properly stored will keep without shrivelling—that is, if they are keeping varieties. Apples keep best in cold storage at a temperature of 32 degrees Fahr.

Codling Moth.—See that all infested apples, pears, and quinces are picked and destroyed regularly, and all bandages attended to every eight days, and all grubs found underneath such bandages killed.

Pear and Cherry Slug.—Messrs. Thos. Hawke, Hicks, and others in the Orange district, speak most highly of arsenite of soda for pear and cherry slug, and at the time of my visit, during the last week in January, they were busy giving the last application for the season.

Fruit Fly.—As this pest is found in so many of our fruits, it would be well if growers would pick up and destroy all fallen fruit every two days, and either burn or boil it in order to destroy as many of the grubs as possible, as by so doing we should in a season or two reduce this troublesome pest so greatly that the fruit destroyed by its ravages would not cause the growers any serious loss. The best results can only be obtained by every grower doing his or her best to destroy every fruit in which the grub of the fruit fly is to be found before they leave the fruit. Therefore, we will all have to work with a will and do our best to see that no fault rests with us if any fly-infested fruit is found on our property, or allowed to remain under the trees as a breeding-ground to increase their numbers.

Pruning.—At no time in the year can the result of different methods of pruning be seen so well as when the fruit is ripening, when each variety should be closely watched, and such notes taken thereon as will serve as a guide for the following year's pruning. It is always well to bear in mind that trees or vines must not be overloaded if they are expected to produce regular crops of high standard fruits, which quality alone will



always command the highest prices on the market and best repay the grower, whilst taking the least out of the trees or vines.

Fruit Drying.—The drying of apples, raisin grapes, sultanas, and prunes will, where these fruits are being grown, occupy the atention of the orchardist. After the apples are peeled and sliced they should be immersed for five minutes in a brine made as follows:—Dissolve 1 oz. of salt and dilute with 2 quarts of water: then spread the fruit on trays, and place in the sun or evaporator to dry. The prune and Gordo Blanco grapes are, when ripe, immersed in a lye made as follows:—Dissolve, by boiling, 1 lb. of caustic soda in from 8 to 10 gallons of water, and in this dip the fruit, when the solution is boiling, for about one or two seconds, or just long enough to make minute cracks in the skins. In some districts the skins will be found tougher than in others, and, therefore, it will be necessary to test the fruit to find out for what length of time it will need to be immersed in order to slightly crack the skins. Prunes must have their skins cracked more than raisin grapes.

Over-dipping must be avoided, else the fruit when dried will be ragged, and would be classed inferior in consequence. Before packing prunes, they should be dipped in boiling water for at least five minutes, then put out in the sun to dry thoroughly before packing in boxes. Those who are most successful in fruit-growing have found that they have had to combine a thorough system of cultivation with proper pruning and judicious manuring to attain these results. There is a time when each of these several branches of the work should be done, and by neglecting to properly attend to any one of them certain loss to the grower will inevitably follow.

In response to the invitation issued to fruit-growers by the Department of Agriculture to visit the orchard at the Bathurst Experimental Farm a large number availed themselves of the opportunity. There were over 175 fruit-growers at the morning inspection and over 300 during the afternoon. Considerable interest was manifested by those present in the work as carried out in the orchard, particularly with reference to the varieties grown and the system of pruning, green-manuring, and cultivation adopted. At the end of the day's inspection many expressed their approval of this departure of the Department in bringing fruit-growers together from all parts of the State, and hoped it would lead to many more such gatherings, not only at Bathurst, but at the other experimental farms.

COLOURED PLATE.

Susquehanna Peach.—This is a particularly showy peach, which on our light rich soils grows to an immense size. Unfortunately it has not proved a heavy cropper. It ripened at Richmond about the 20th January. Skin rich yellow nearly covered with red, with sature half way round. Flesh yellow, sweet, juicy, with rich flavour. A freestone suitable for dessert, drying, or canning.

California.—This peach is cropping well with us in light soil, and is suitable for canning purposes, being a yellow-fleshed clingstone, ripening in early districts about the 20th January. It is said to have originated in Sacramento, California. As can be seen in the coloured plate, it is large, fairly well coloured, the skin being of an orange colour partly covered with a rich red. Good rich flavour, and well worth a place in the orchard.

Practical Vegetable and Flower Growing.

W. S. CAMPBELL.

Directions for the Month of March.

Vegetables.

THE summer which is drawing to a close has, on the whole, been a good one for vegetables and flowers, for, except in a few districts, rain has been abundant, and vegetables, where they have been grown, are plentiful.

Fig. 1.—Tomato staked but untrained.

Since making a few notes last month about tomatoes, the artist has taken photographs of some of my plants, in order to illustrate the system of growing tomatoes to a single stem, which I strongly advise should be adopted by all who grow their own vegetables. Generally speaking, no system of training is carried out, for the plants are just left to themselves, or, perhaps, bunched up to a stake, as shown in illustration Fig. 1 of a tomato which I grew for the purpose of contrast.

Fig. 2.—Tomato trained to a single stem.

Illustration Fig. 2 shows three plants of a new tomato named Eclipse, which I consider to be a good one, and very prolific, with nice, large, smooth, and bright-coloured fruits. This shows very well the simple and effective system of training to one stem. As soon as the young tomatoes

are planted, drive in stakes alongside them, which, when driven well in the ground, stand about 5 feet high above the surface. As the plants grow, pinch off all side-shoots as they appear, allowing the leading shoot only to grow. As the plants increase in height, tie them closely to the stakes, but in such a manner that the ties cannot cut into the stems. I use raffia fibre, which I find to be better than anything else for the purpose. If you desire to increase your stock of plants, which probably

Fig. 3.—Tomato trained to two stems.

will be the case with new varieties of high repute, costing, perhaps, 2s. 6d. for a dozen seeds, it is very easy to do so, by making use of the side-shoots. I increased my stock considerably in that way, and, by distributing the plants, gave others a chance of trying the new varieties. When the side-shoots are 2 or 3 inches long, remove them, trim off the end

of the cutting just below a leaf, and remove all but two or three leaves. Insert the cutting in pure clean sand, keeping this sand moist, and in a few days the cuttings will strike root. A small hand-glass will be found invaluable for use in striking cuttings. Let the cuttings have abundance of light, and never keep them in a dark place. As soon as the cuttings have made a few roots, move them to some good soil, and after they have started to grow plant them out. The plants which are being trained will soon begin to flower, and presently fruit will form. After a good few bunches have formed along the stem, pinch off the tops of the plants—say, after they are 4 or 5 feet in height. The plants will make efforts to send out more side shoots, but keep on removing them as long as any appear.

Illustration Fig. 3 shows a plant of Improved Duke of York, which is a very fine variety indeed, and one I can highly recommend. This plant I allowed to grow with two stems, which is a good plan, but not so easy to manage as the single stem. In order to show the fine crop of fruit, I moved one of the stakes and spread out the plant. If trained so far apart, the weight of fruit would probably break down one stem. This plant was still flowering when the photograph was taken, and it has since produced many more fruits.

Broad Bean.—Towards the end of the month, if the season is good, a few seeds of this vegetable may be sown.

Bean, French or Kidney.—There is a good deal of risk in sowing this bean in the cool and cold districts, for early frosts would probably cut down plants before they came into bearing: but in warm districts about the coast, a sowing or two may be made. It is quite possible we may have a severe winter; therefore, it is not advisable to chance the growing of tender vegetables, except in the mild districts of the State.

Beet, Red.—Sow a little seed now and then, just to keep enough plants growing for requirements.

Beet, Silver.—If a stock of plants is not available, a sowing may be made.

Borecole or Kale.—This is a good vegetable for the cool climates, where it can be grown in the greatest perfection. Sow as extensively as may be required during the month.

Cabbage, Broccoli, Brussels Sprouts, and Cauliflower.—These vegetables may all be treated in the same way, for their requirements are practically the same. Broccoli and Cauliflower should not be allowed to suffer any check during their growth from time of appearance of the seedlings to time of making their heads. All the above vegetables need abundance of well-rotted manure if the soil is not naturally rich, and it is not often that soil cannot be improved for such vegetables by manuring; but take note that the manure should have been rotted before it is applied to the soil.

Celery.—Sow a little seed, and plant out any good-sized seedlings, or preferably plants which have been pricked out from the seed-bed. Heavy manuring and a plentiful supply of water is necessary for the production of good celery.

Cress and Mustard.—If the season is very dry it is hardly worth while sowing seed; but, of course, if water is abundant, and a good salad is required, sow by all means from time to time.

Endive.—This is a useful salad plant for cool climate districts, where it should succeed very well indeed. Sow a little seed from time to time. Transplant the seedlings to well-manured ground when they are large and strong enough to stand the shift.

Leek.—Sow seed as extensively as may be required. When the seedlings are large enough, plant out in shallow trenches on well-manured land. The leek is a greedy feeder, and needs rich food to enable it to grow to perfection.

Peas.—This useful vegetable may be sown during the month, and if the weather is satisfactory it should do very well. Begin with a dwarf variety, and follow with one or more of medium height.

Radish.—Sow a little seed of several kinds from time to time. I saw last week, at an agricultural show, many exhibits of radishes, and they were so large and pithy as to be unfit for consumption. The radish should be pulled whilst quite young and tender and digestible.

Sea Kale.—Sow a little seed in seed-bed.

Spinach.—Sow a little seed in drills where the plants are to grow. Thin out the seedlings, when they are well grown, to about 18 inches apart.

Shallots, Potato-onion, Tree-onion, and Garlic.—Plant out a few sets of each during the month.

Flowers.

This is about the best time of year for planting out all kinds of spring flowering bulbs, such as the narcissus, the daffodils, jonquils, tulips, hyacinths, crocus, snowdrops, snowflakes, ixias, babianas, anemones, ranunculuses, varieties of iris, sparaxis, Watsonia, tritelieas, and others.

If the season is good, plant out pansies, stocks, cowslips, daisies, polyanthuses, and other perennials.

Sow seeds of hardy annuals of all kinds, and also sow perennials and biennials.

Prepare for the autumn sowing of evergreen plants, and also have everything ready for cuttings of roses and other hardy plants.

The sowing of sweet-peas should not be overlooked this month.

Farm Notes.

HAWKESBURY DISTRICT—MARCH, 1907.

H. W. POTTS.

THE intense state of drought prevailing this summer has been temporarily relieved by welcome thunderstorms during January and February, giving a total rainfall of 3 inches. Grazing lands were rapidly covered with a green growth. The character of the rainfall was such as to afford no stimulus to the summer crops. Maizes, potatoes, millets have failed. The former failed as a grain crop, and in most instances the stalks have been used as green feed for stock or converted into ensilage. Where pits or tubs are available, they have been filled. Those who wisely put in crops of maize and millets after the rainfall in January, will reap the benefit in autumn. They germinated rapidly, and now show vigorous growth. These require to be constantly cultivated to tide them over the dry conditions prevailing this month, to check evaporation, keep down weeds, and aerate the soil. These will afford green feed to the end of May, and, where not required, may be converted into stack ensilage, should the tubs or pits be filled.

Sorghums.—These crops have had a most trying time: growth was practically suspended in the young plants for several weeks, owing to the absence of moisture. The recent rains have been just sufficient to give them a start, and the growth may now be stimulated by constant and shallow cultivation. It should be remembered that sorghums will provide green feed right into July. This plant is hardier than maize in the later stage, and will successfully resist the early light frosts. Moreover, the crops can always be conserved as ensilage for early spring use in the cow-shed.

Lucerne (Alfalfa).—No opportunity should be allowed to escape in extending the sowing of the most valuable of all fodders. No plant, so far, has been able to compete with lucerne in its manifold qualifications as feed for stock. Every autumn the farmer should systematicallly arrange to extend the area for lucerne. The best results are obtained by sowing in the fall of the year. For this purpose, it is important to select a good friable soil, deep penetrable subsoil, with free natural drainage. Loam soils, with a fair quantity of sand in it, always afford good returns, and suit the disposition and habits of the plant. Where a catch leguminous crop has been taken off, such as cowpeas, the land will be in a favourable state. The land is also better, a few months beforehand, with a dressing of lime or gypsum. The seed-bed must be fine, and possess sufficient moisture to insure rapid germination. A rich soil is not an essential factor to success. It is simply surprising to note the vigour

and hardiness of its growth in comparatively poor loams, provided there is a fair depth and the drainage complete. In some cases it is not possible to lime the land; superphosphate, 2 cwt. to the acre, may be used as a dressing instead. In the selection of seed, be especially careful to purchase from a reliable and clean source. Take every precaution to avoid seed intermixed with dodder, otherwise it will give endless trouble later on. The quantity of seed to sow should be from 15 to 20 lb. to the acre.

Rape.—Early winter crops of rape will be most acceptable and useful this year, mainly owing to the failure of our hay crops in the spring. Every effort has to be made to encompass this loss and meet the want of other stored fodders. In rape, we have an excellent catch crop which grows rapidly, and comes in at a period when a change of fodders is most beneficial to horses, cattle, sheep, pigs, and poultry. Few men credit the statement that rape provides a higher percentage of food nutriments than clover. It is equally relished by all stock. For cows in milk, it has to be fed after milking, in order to avoid the taint which it invariably imparts if fed before milking. For fattening lambs it is of great service, and no more succulent or reliable food can be found for pigs and poultry. Sowings put in this month will afford a good crop in the latter part of May. The land only requires ploughing once, and then brought to fine tilth. Where the prospect of a damp autumn is assured, then the crop may be sown broadcast, 6 lb. seed to the acre. Where it is best to drill, use 4½ to 5 lb. to the acre. The best variety is Dwarf Essex. Loose sandy, loamy, soils provide the best food for growth. It is not an uncommon occurrence to secure 10 tons of green feed to the acre from rape. The best fertiliser to use is fresh farm-yard manure; failing a supply of this, an artificial one may be used, as per the following formula:—

Nitrate of soda	37	parts.
Blood (dried) .	33	,,
Superphosphate .	180	,,
Sulphate of potash .	60	,,

About 2 cwt. to the acre. With a firm, clean, seed-bed, well rolled after sowing, and fair moisture, the returns will be most profitable. The effect of this useful catch crop in preparing the land for a crop of maize is marked, and forms a leading feature in the rotation. The rape plant root system is a deep one. It penetrates the subsoil, and takes up phosphoric acid and potash, as well as opens the subsoil, making it suitable to nourish a deep-rooted crop of maize following. If fed off by sheep or pigs the manurial return is a gain, and leaves the soil in good fertile condition.

Macaroni Wheats.—These are useful for green fodder along the coastal areas, provided they are sown early. The chief advantage arises from the fact that, when cut green and top-dressed, with 1 cwt. per acre of superphosphate harrowed in, a good crop of grain is ensured. As hay,

the macaroni wheats provide payable yields. The greatest care must be taken to cut this crop before it is too ripe, as, once they begin to ripen, the strong beard becomes harsh and injurious to stock.

Wheats for Hay.—This month is somewhat early to sow wheats for hay; but towards the end or commencement of the following month the late-maturing varieties may be sown, such as Blount's Lambrigg, Nonpariel, Australian Talavera, and White Lammas. Plough twice to get the ground in order, and use blood, bone, and superphosphate, ½ cwt. to the acre. A number of tests have been made with several of the late Mr. Farrer's new varieties for hay, and that newly-fixed variety called Thew promises to give the best results in this district. Mr. Sutton recommends it as being early in habit, rust-proof, with good clean straw.

Oats.—The land can be got ready for the main crop of oats intended for green feed or hay. Where the soil requires manure, the best is blood, bone, and superphosphate for the light loams of the district. The mixture is one part each of blood and bone with two parts of superphosphate. The "Potato" oat affords the heaviest crop of green feed: Algerian always the earliest matured crop, and yields heavy, and is least liable to rust. Black and White Tartarian are also varieties worthy of attention. Where suitable conditions prevail, such as well-drained rich soil, Skinless oats provide a good crop: 1½ bushel to the acre is sufficient seed of this sort, but with the others, the quantity should be increased to 2 bushels. The addition of Black vetches to either oats, barley, or rye, pay well, owing to the increased nitrogenous food it affords, especially for dairy stock; ½ bushel to the acre is sufficient with the main crop.

Barley.—The earliest and most certain crop for green feed is that from the Skinless variety. On light, loamy, warm soils, with effective drainage use 1½ bushel of seed to the acre. In the case of manure being required, use 2 cwt. superphosphate and ½ cwt. nitrate of soda to the acre. Cape barley has a reputation here, and has always given satisfactory yields.

Rye.—This hardy cereal has, in the past, proved eminently suitable for our light, sandy, poor uplands. It can be grown under the most adverse conditions, and whilst it does not give the food nutrients, either in quantity or richness provided by the other cereals, yet it is prudent farming to have an area of rye, owing to its great power to resist dry weather and harsh temperatures. It is always the most certain crop, and will give green feed when the others fail. The varieties best known here are the Emerald and Thousandfold. Sow 1½ bushel to the acre.

Cowpeas.—Again, this season, of all others experienced here, has completely demonstrated the high position this rich, green, succulent, nitrogenous food occupies in the height of summer for feeding all classes of domestic stock. It was the only green feed available for grazing off this summer. It must become a permanent crop in our rotation. The great advantage lies in its power to restore fertility, in addition to giving

succulent fodder when others are unavailable. When manuring the ground occupied by cowpeas for the succeeding cereal crop, only half the artificial manure is required.

Carrots and Parsnips.—At the end of this month these may be sown after the soil has been thoroughly cultivated to a good depth.

White Mustard may be sown alone or with rape; in the warm soil it will give rapid growth and forms a useful catch crop.

Swedes and Turnips.—These may be sown after the soil has been brought to a fine condition. Sow 1½ lb. to the acre, in drills 2 feet 6 inches apart. The manure best suited to the crop is superphosphate 2 parts, bone-dust 1 part, 1½ cwt. to the acre.

Monthly Weather Report.

HAWKESBURY AGRICULTURAL COLLEGE, RICHMOND.

Summary for January, 1907.

Air Pressure (Barometer).			Shade Temperature.				Air Moisture Saturation = 100.				Evaporation (from Water Surface).		
Lowest.	Highest.	Mean.	Lowest.	Highest.	Mean.	Mean for 14 years.	Lowest.	Highest.	Mean.	Most in a Day.	Total for Month.	Monthly Mean for 9 years.	% of the year's Evaporation.
29·58 28	30·84 12	30·00	54·3 20	98 0 4	73·1	73·63	45 6	100 27	62·35	·383 7	6·556	5·884	14

Rainfall (as recorded).										
Points	13	1	9	3	3½	78	39	3	= 149½ points.	Mean rainfall for 15 years. 287 points.
Dates	2	9	15	18	19	27	28	30		

Wind ...	N	NE	E	SE	S	SW	W	NW
	4	19	8	7	8	4	3	1

Thunderstorms on dates—1, 21, 26, 29.

Greatest daily range of temperature—37·2° on 20th.

Days on which temperature rose above 90°—	4	5	6	20	22	23	28	30
	98	92·4	94	91·5	93·8	91·3	91·1	91·5

Remarks:—A cool month. The rainfall still much below the average.

W. MERVYN CARNE,
Observer.

Crown Lands of New South Wales.

The following areas will be available for selection on and after the dates mentioned:—

For Conditional Purchase Lease.—(Available under Section 10 of Act of 1905. Regulations 356 to 365. Applications to be made on Form No. 114).

C. P. L. No.	Name of Land District	Holding.	Total Area.	No. of Blocks	Area of Blocks.	Distance in Miles from nearest Railway Station or Town.	Annual Rental per Block.	Date available.
			acres.		acres.		£ s. d	1907.
56	Armidale ..	....	......	1	1,734	Guyra, 24 miles; Armidale, 36 miles	32 10 4	14 March

Ridgy, hilly, and mountainous thick forest country of slate, trap, and basaltic formation; very rocky in places, with deep gullies between the hills; soil—light and very stony, and gravelly over most of the area; clay and rock subsoils; timbered with gum, box, pine, cherry, ironbark, stringybark, peppermint and apple; not suitable for agriculture, but sound sheep country; present carrying capacity, 1 sheep to 3 acres, or 1 head of large stock to 15 acres; improvable at an average cost of about 2s. per acre to 1 sheep to 1½ acres, or 1 head of large stock to 7½ acres. The mean annual rainfall at Guyra is 34·81 inches. Ample permanent water in the branches of Louisa Creek.

57	Armidale .	.....	1,389	2	694 and 695	Guyra, 13 miles	26 0 6 and 26 1 4 respectively	14 March

Basaltic formation; level and gently undulating, very stony in places; chocolate and black soil; basalt and clay subsoil. About 100 acres agricultural; good grazing land, best adapted for cattle, will fatten in summer months and after improvement, timber gum, ash, peppermint saplings thick in places, and several fairly large open flats, no scrub. Water scarcely permanent, but may readily be conserved in Boundary Creek at small expense.

54	Casino	....	595½	2	325 and 270½	Casino, 12 miles	10 12 6 and 10 11 6 respectively.	4 April

Basaltic and sandstone formation; sandy and rich black alluvial soil, clay and sand subsoil; open forest country, timbered with gum, oak, mahogany, apple, and bloodwood; about 190 acres suitable for agriculture. Permanent water in Eden Creek and lagoon within the portion.

55	Casino	..	3,065	2	1,313 and 1,752	Casino, 25 to 27 miles, Lawrence 23 to 25 miles, Camira Railway Station, ½ to 2 miles.	24 12 6 and 32 17 0 respectively.	4 April

Undulating and low ridgy country of sandstone formation; soil sandy and gravelly, with clay subsoil; inferior grazing capacity, which could be improved by ringbarking and suckering at a probable cost of 2s. 6d. per acre, mostly thick forest country, timbered with gum, apple, ironbark, mahogany, bloodwood, honeysuckle, and oak; suitable for fencing and building purposes. Permanent and sufficient water in lagoons on portion.

50	Grafton .	......	..	1	2,387	Grafton, 17 miles; Sportsman's Creek Railway Station, 5 miles.	44 15 2	14 March

Undulating to steep sandstone country, with light soil, inclined to be sandy, with darker soil on the small flats. The land is sound, and when cleared will be available for dairying. All thick forest country, timbered with gum, oak, ironbark, stringybark, apple, bloodwood, and box; also some emu bush. Not suitable for cultivation. Permanent water in Fortis Creek and waterholes.

58	Molong .	Yullundry	......	1	610	Village of Cumnock, 7 miles; Molong 23 miles.	22 17 6	4 April

Timbered with white and yellow box; gently undulating country, slate and granite formation; soil—reddish sandy loam, rich, red soil, fit for wheat-growing in parts. Water not permanent, but may be obtained by sinking.

51	Murwillumbah.	......	......	1	220½	Mullumbimby, 2½ miles by road.	24 16 2	21 March.

Very steep, broken country, of basaltic and slate formation; soil mostly rich chocolate clay; medium light soil in places; about 50 acres open forest, timbered with blackbutt, gum, box, bloodwood, and oak, and about 170 acres dense brush; suitable for dairying, but not for agriculture. Water, doubtful, if sufficient, might be conserved by sinking.

FOR CONDITIONAL PURCHASE LEASE—*continued.*

C.P.L. No.	Name of Land District	Holding.	Total Area.	No. of Blocks.	Area of Blocks.	Distance in Miles from nearest Railway Station or Town.	Annual Rental per Block.	Date available.
			acres.		acres.		£ s. d.	1907.
52	Murwillumbah.	.....	404	2	230 and 174	Murwillumba, 16 miles; village of Tyalgum, ½ mile.	17 5 0 and 15 4 6 respectively.	21 March.

The 230-acre block consists of undulating to mountainous country, generally of slate formation, but in parts of sandstone and basalt; good dark loam on flats and slopes, and sandy clay soil on ridges; generally pipeclay subsoil; about 10 acres poor grazing, remainder has no natural pasturage; sound country, suitable for fattening or breeding cattle, when improved by clearing and planting grasses would carry one beast to 2½ acres; about 30 acres thick forest country, timbered with box, bloodwood, oak, gum, blackbutt, and tallow-wood; about 60 acres level, dense, softwood brush, with scattered hardwoods, and about 140 acres of brush, mixed with bloodwood, box, messmate, gum, tallow-wood, and oak hardwoods suitable for building and fencing purposes; and the 174-acre block is described as generally hilly, of slate formation; good dark loam on flats, sandy loam and sandy clay soil on ridges, clay subsoil; about 50 acres open forest; ridge and open flat grassed with blady and kangaroo grasses; poor grazing; sound country; suitable for dairying, breeding, or fattening cattle, and when cleared and grassed would carry about one head of large stock to 2½ acres; about 50 acres open forest country, timbered with box, gum, bloodwood, oak, and blackbutt; about 20 acres softwood brush, and about 100 acres brush, mixed with hardwoods; timber suitable for fencing or building. Water abundant in middle arm of Tweed River, which these blocks front.

53	Murwillumbah.	......	706½	3	217 to 255	Murwillumbah, 18 miles by road, 11 miles by rail, and road from Upper Burringbar Railway Platform distant 2 to 2½ miles.	10 17 0 to 11 14 6	21 March.

Very mountainous, steep, rough, and broken country; basaltic and slate formation; soil varies from rich chocolate clay to very inferior sandy soil; no land suitable for agriculture; a little more than half the area consists of fairly open forest country, timbered with blackbutt, gum, bloodwood, turpentine, ironbark, box, tallow-wood, and oak; mostly suitable for building and fencing; the remainder of the area consists of dense brush. Burringbar Creek supplies two of the blocks with permanent water; on the other block water is always obtainable by sinking.

61	Murwillumbah.		3,080½	16	158 to 276	Murwillumbah, 19 to 25 miles	5 19 2 to 13 16 0	21 March

Mostly hilly, parts steep but not precipitous; basaltic and partly sandstone formation; chocolate soil, subsoil clay and rock; parts suitable for cultivation; the area consists of thick forest country, timbered with gum, box, ironbark, turpentine, tallow-wood, bloodwood, oak, &c., and dense softwood brush, pine, fig, &c., mixed with hardwoods. Sufficient water supply.

59	Muswellbrook.	....	....	1	440	Merriwa, 11 miles; Muswellbrook, 58 miles; Public School, 3 miles.	17 8 4	7 March.

Low, stony, basaltic ridge, and undulating to level country; loose or friable reddish or brown clay soil of great depth, except on stony ridge; timbered with stunted open box Rainfall, about 25 inches. About 170 acres in three (3) parts suitable for wheat and maize growing; the remainder suitable for sheep. No natural water supply, but may be obtained in wells.

60	Muswellbrook.	......	.....	1	219	Muswellbrook, 33 miles; Merriwa, 10 miles; Public School, 1 mile.	7 6 0	7 March.

Partly good level flats, and partly undulating, sandstone ranges and ridges; black soil along the creeks and flats and between ridges, rocky, stony, and sandy on the hills; about 122 acres open forest, timbered with gum, ironbark, pine, and a little oak and apple, and 97 acres of nearly plain country; about 50 acres suitable for wheat-growing, the remainder sound fattening country for either cattle or sheep. Rainfall, about 23 inches. Water permanent in Gungal Creek.

FOR ORIGINAL HOMESTEAD SELECTION ONLY.—(Available under Section 14 of Act of 1895. Regulations 49 to 58A. Applications to be made on Form No. 7).

H.S. No.	Name of Land District.	Total Area.	No. of Blocks.	Area of Blocks.	Distance in Miles from nearest Railway Station or Town.	Annual Rent per Block.	Date available.
		acres.		acres.		£ s. d.	1907.
1,008	Hillston	876	7	50 to 201.	Hillston, 1¼ to 2½ miles ..	1 6 8 to 3 15 0	21 Mar.

Level country, black and red soil, clay subsoil; open country, mostly suitable for cultivation in the natural state; no natural water supply, but may be obtained by sinking about 100 feet.

For Original Settlement Lease Only.—(Available under Section 25 of Act of 1895. Regulations 148 to 157D. Applications to be made on Form No. 50).

S.L. No.	Name of Land District.	Holding.	No. of Farms.	Area of Farms.	Distance in Miles from nearest Railway Station or Town.	Annual Rent per Block.	Date available.
				acres.		£ s. d.	1907.
850	Condobolin ..	Crown Camp.	1	3,340 1 rood	Condobolin, 30 miles, Wyalong, 35 miles.	27 6 8	21 Mar.

Slightly undulating country; red loamy soil; about 20 acres low granite ridge near southern boundary of portion 9; scrub country, timbered with box, pine, oak, and yarran, and covered with scrub of pine (chiefly), wattle, camomile, buddah, hopbush, and gooma. No natural water supply; a tank of about 2,737 cubic yards capacity exists; soil is suitable for conservation of water.

848	Hay	Tchelery	1	9,185	Moulamein, 27 miles.	38 5 6	11 Apl.

Open, level, red and gray clayey soil; grassed plain a little scalded, and partly wind-swept; sound fattening sheep land, devoid of timber. No natural water supply. Good catchment for tanks.

851	Moree. ..	Midkin .	1	6,000	Moree, 50 miles.	62 10 0	4 Apl.

Level country, lightly timbered with coolabar and belah; chiefly black soil, with clay subsoil, most of it liable to inundation from Bigleather watercourse; about 500 acres in thick forest timbered with belah and coolabar, about 4,000 acres open forest country, timbered with coolabar and a little belah, and about 1,500 acres plain in different parts; the best of the timber is suitable for fencing and rough buildings; about 800 acres are above flood mark; grazing capacity, 4 acres to a sheep, which can be improved by ringing; rainfall 21·44 inches; rabbits exist on the land, but are not numerous. No permanent water supply, but can be conserved by means of tanks and dams.

849	Walcha .	.... .	1	8,776 acres (about). This area is subject to alteration when surveyed	Walcha, about 40 miles; Walcha Road Railway Station, about 52 miles.	51 16 4	28 Mar.

Hilly and ridgy country, with steep, stony sidlings into Joyce's Creek and Warne's River, precipitous falls into Yarrowitch River, and grassy flats in between the timbered ridges; mostly light loamy soil, of slate formation, and partly red stony soil, of basalt formation, about 500 acres thick oak forest; about 5,000 acres thick forest; about 1,500 acres open forest; and about 1,770 acres inaccessible falls country; timbered with gum, box, oak, stringybark, messmate, and wattle Sufficient water in Yarrowitch River, Martin's Creek, Bob's Gully, Black's Camp Creek, and Rocky Waterhole Creek, &c.

For Original Conditional Purchase Only.—(Classified under Subsection 1 (a), Section 4, of Crown Lands Amendment Act, 1905.) Available under Section 26 of Act of 1884. Regulations 74 to 130. Application and declaration to be made on Forms 21 and 22.

Name of Land District.	Name of Holding, &c.	Parish.	County.	Total Area.	Price per Acre.	Date available.
				a. r. p.	£ s. d.	1907
Bathurst ..	....	Oberon	Westmoreland	50 0 0	0 11 8	18 Apl.
Molong* ..	Canowindra Suburban Lands.	Collett . ..	Ashburnham	48 1 24	5 0 0	25 „
Suitable for grazing; being portions 135 to 139; suitable for agriculture						
Parramatta ..	....	Castle Hill	Cumberland	42 3 0 40 2 0 and 40 3 0	0 10 0 1 0 0 and 1 10 0	21 Mar.

Being portions 156, 158, and 157; distant about 9 miles from Pennant Hills Railway Station; suitable for orchards.

*Identical with Special Area, see p 293.

For Original Conditional Purchase and Conditional Lease in virtue thereof.—(Classified under Subsection 1 (b), Section 4, of Crown Lands Amendment Act of 1905); available under Sections 26 and 48 of Act of 1884. Regulations 74 to 130. Application and declaration for Original Conditional Purchase to be made on Forms 21 and 22, and for Conditional Lease on Forms 95 and 96.

Name of Land District.	Name of Holding, &c.	Parish.	County.	Total Area.	Price per Acre.	Date available.
				a. r. p.	£ s. d.	1907.
Albury ..	On Walla Walla Holding.	Sherwyn	Hume .	320 0 0	3 5 0	28 Mar.
		On Billabong Creek; suitable for agriculture				
Barmedman ..	On Quandary South Holding (partly)	Quandary ..	Bourke ..	1,200 0 0	1 0 0	28 Mar.
		On Mirrool Creek; suitable for grazing and agriculture.				
Condobolin .	Within Resumed Area No. 763.	Emu Plains . ..	Cunningham	1,515 0 0	0 13 4	7 Mar.
		Being portion 43; suitable for grazing and agriculture.				
Condobolin .	On Borambil Holding.	South Borambil .	Gipps .	640 0 0	1 10 0	28 Mar.
		Being portion 81; suitable for grazing and agriculture.				
Coonabarrabran	.. ..	Bugaldie . .	Baradine ..	100 0 0	1 0 0	28 Mar.
		Suitable for grazing.				
Forbes .. .	.... .	Boyd . .	Forbes .	214 1 0	1 10 0	21 Mar.
		Being portion 116; suitable for grazing and agriculture.				
Forbes	....	Boyd	Forbes	214 3 0	1 10 0	28 Mar.
		Being portion 117; suitable for grazing and agriculture.				
Glen Innes .	On Strathbogie and Rocky Creek Holdings.	Strathbogie North..	Gough	510 0 0 and 1,550 0 0	0 16 8	28 Mar.
		Suitable for grazing.				
Gundagai .	....	Wagara	Buccleuch	450 0 0	2 0 0	18 Apl.
		Suitable for dairying, grazing, &c.				
Gunnedah .	....	Denison West ..	Pottinger .	7,030 0 0 1,980 0 0 and 900 0 0	0 6 8 0 10 0 and 0 15 0	21 Mar.
		Suitable for grazing.				
Gunnedah .	On Bando Holding.	Bando .. .	Pottinger	500 0 0	3 0 0	28 Mar
		On Turrabole or Cox's Creek; suitable for grazing and agriculture.				
Gunnedah ..	....	Vickery	Nandewar ..	760 0 0	1 5 0	28 Mar.
		Suitable for grazing and agriculture.				
Inverell .. .	Within Resumed Area No. 788 (partly).	Adowa, Ashby, Bowman, Chapman, &c.	Arrawatta ..	13,200 0 0	0 11 8	11 Apl.
		Suitable for grazing.				
Molong	....	Gumbla and Nanami.	Ashburnham	330 0 0 and 400 0 0	1 0 0 and 1 10 0	4 Apl.
		Suitable for grazing and agriculture.				
Molong .. .	....	Trajere	Ashburnham	590 0 0	1 10 0	4 Apl.
		Suitable for grazing and agriculture.				
Molong	....	Belubula	Ashburnham	310 0 0	1 10 0	4 Apl.
		Suitable for grazing and agriculture.				
Parkes and Forbes.	On Barrawang Holding (partly)	Mononie and Goobang.	Cunningham	750 0 0	1 5 0	18 Apl.
		Suitable for grazing and agriculture.				
Queanbeyan ..	....	Bullongong . .	Murray ..	1,280 0 0	0 10 0	18 Apl.
		Suitable for grazing.				
Rylstone ..	....	Umbiella	Roxburgh ..	160 0 0	1 0 0	14 Mar.
		Suitable for grazing.				
Rylstone ..	....	Growee	Phillip ..	216 0 0	1 0 0	25 Apl.
		Suitable for grazing.				
Tumut	....	Adjungbilly .	Buccleuch ..	540 0 0	0 15 0	7 Mar.
		Suitable for grazing and agriculture.				
Wagga Wagga..	Berry Jerry and Arajoel Holding	Berry Jerry ..	Mitchell ..	640 0 0	1 16 8	21 Mar.
		Being portion 90; suitable for grazing and agriculture.				
Wagga Wagga.	Berry Jerry and Arajoel Holding	Arajoel and Bulgary	Mitchell ..	700 0 0	1 18 4	21 Mar.
		Suitable for grazing and agriculture.				
Wellington ..	....	Warne	Wellington ..	570 0 0	1 0 0	11 Apr.
		On Kerr's or Larras Lake Creek; suitable for grazing and agriculture.				

CONDITIONAL PURCHASE (ORIGINAL OR ADDITIONAL) OR CONDITIONAL LEASE.—(Available by revocation of reserves, and not classified or specially set apart under Section 4 of the Crown Lands Amendment Act of 1905.) Available under Sections 26, 42, and 48 of Act of 1884. Regulations 74 to 130. Application and declaration for Original Conditional Purchase to be made on Forms 21 and 22, and for Additional Conditional Purchase or Conditional Lease on Forms 95 and 96.

Name of Land District.	Name of Holding, &c.	Parish.	County.	Total Area.	Price per Acre.	Date available.
				a r p.	£ s. d.	1907.
Gunning ..	....	Blakney .	King . ..	200 0 0	1 0 0	23 Mar.
Within that part of Blakney Creek Village Reserve, revoked 23rd January, 1907.						
Hay	On Tchelery Holding.	Tchelery and Magnolia.	Wakool and Waradgery.	5,200 0 0	1 0 0	11 April
Within Water Reserves 965, 965 Extension, and 33, 296, to be revoked 6th February, 1907.						

CONDITIONAL PURCHASE AS SPECIAL AREA.

Molong Land District, within Canowindra Suburban Lands, 48 acres 1 rood 24 perches, minimum area 9 acres 32 perches, maximum area 10 acres, being portions 135 to 139, parish o' Collett, county of Ashburnham, suitable for agriculture, price £5 per acre. Available for original applications on 25th April, 1907.

FOR IMPROVEMENT LEASE—(Available under Section 26 of Act of 1895. Regulations 157E to 160 and 250 to 262A. If not bid for at auction may be subsequently applied for on Form 91).

Block Numbers.	Land District or Place of Sale.	Name of Holding.	No. of Blocks.	Area of Blocks.	Upset Annual Rental per Block.	Date of Sale.
		EASTERN DIVISION.				
				acres.	£ s. d.	Sale. 1907.
615	Walcha . . .	Emu Creek .. .	1	2,430	10 0 0	18 March.
Undulating to hilly country of slate formation, soil of average quality but sparse; timber—stringybark, gum, peppermint, and messmate; mostly thick forest, some open forest. Water not permanent on the area, but may be conserved in shallow tanks and dams in the water channels. Average annual rainfall about 29 inches. Dogs are troublesome. Situated about 24 miles south-easterly from Uralla, and about 12 miles north-easterly from Walcha.						
		CENTRAL DIVISION.				
1391 to 1406	Hillston and Hay ..	Cowl Cowl ..	16	1,500 to 20,480	5 9 5 to 73 15 0	Hillston, 22 March.
Red sandy soil, clayey in places; timbered with belah, pine, mallee, yarran, and box; scrubs—currant-bush, needlewood, wilga, apple bush. No permanent surface water; good facilities for conservation. Native dogs and rabbits are numerous on the blocks. The blocks are situated between Hillston and Carrathool, being about 54 miles from the latter village, which is on the Hay-Junee Railway Line.						
1444	Narrabri	....	1	4,424	18 8 8	18 March.
River frontage, mostly low-lying good black soil country, liable to flood, occasional patches of higher land; remaining part of lease mostly very inferior level country, spewey soil, interspersed with large patches of open scalded country, generally poor spewey soil with some stiff gray soil; good grass and herbage country on river frontage, which is fairly heavily timbered with red gum and coolabah; other part thickly timbered with forest oak, pine, box, ironbark, mallee, gum, whitewood, rosewood, and wilga, and scrubs of same. Prickly-pear thinly interspersed throughout the whole area, and also a good quantity of Darling pea. Permanent water in Namoi River, and about six months' supply in Bullerawa Creek. Average annual rainfall, about 23 inches. Badly infested with rabbits. Situated about 22 miles from town and railway station of Wee Waa.						
1445	Narrabri	....	1	3,165	13 3 9	18 March.
Frontage is open country, swampy in places, part black soil liable to flood and part stiff gray soil; openly timbered with coolabah, red gum, and mallee; remainder very inferior level country, mostly spewey soil with reddish sandy surface, occasional patches of scalded land, very thickly timbered with forest oak, box, pine, ironbark, mallee, gum, wilga, whitewood, and rosewood with scrubs of same. Prickly-pear thinly interspersed throughout the whole area, and also a good quantity of Darling pea. Permanent water in Namoi River. Average annual rainfall, about 23 inches. Rabbits are very numerous. Situated about 20 miles from town and railway station of Wee Waa.						

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Sub-Editor not later than the 21st of the month previous to issue.

1907.

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VOL. XVIII. PART 4. APRIL 2, 1907.

Agricultural Gazette of New South Wales.

Milling Characteristics of Australasian Wheats.*

F. B. GUTHRIE AND G. W. NORRIS.

FOR the samples of wheat which form the subject of the present paper, we are indebted to the courtesy of the Agricultural Departments of the Commonwealth and New Zealand. They are representative of the harvest of last year in the respective States. The delay in the publication of results has been due partly to the fact that in some States the harvest was late and the samples were not received until the year was well advanced, and partly to the pressure of other work which prevented the milling of these samples being proceeded with. It was also thought that, as any information afforded by this investigation could not be made use of until the coming season, the results might suitably be presented for discussion before the meeting of the Australasian Association for the Advancement of Science.

In the case of the New South Wales samples the grain is unnamed, and represents the harvests of the different districts into which the State is split up by millers and wheat-buyers. For a description of the individual varieties and their milling qualities you are referred to an article entitled, "Milling Notes on the Varieties of Wheat Grown in New South Wales," appearing in the *N.S.W. Agricultural Gazette* for December, 1906.

The remaining samples are for the most part named varieties, and represent the wheats most generally cultivated in the various States as well as, in some instances, newly introduced varieties. Among the latter, special interest attaches to such wheats as Bobs, Come-back, Jonathan, and Federation—varieties created by the late Mr. Farrer, with the specific object of providing wheat varieties which should be suitable to Australian conditions, and at the same time free from the defect which was universal among Australian wheats, namely, low flour-strength.

The behaviour of some of these wheats in the other States is extremely gratifying, as they have in several cases shown a power of retaining their high flour-strength in districts where the undoubted tendency is a gradual deterioration in this important particular.

Those who have followed recent work on the subject will have realised that the question of flour-strength is one that is daily increasing in importance.

English millers and wheat buyers demand before all things a flour of high strength, and the top prices in the English market are paid for such wheats as Canadian and some of the Russian and American varieties, which are pre-eminent in this respect. On the local markets, also, higher prices are paid

* A Paper read before the Agricultural Section of the Australasian Association for the Advancement of Science, Adelaide, January, 1907.

for such imported wheat and flour as are typified by the "Manitoba" wheats, as they are essentially bakers' wheats.

Both the milling trade and the scientific authorities in England are paying increased attention to this question, which is undoubtedly the one that will dominate the future of the wheat and flour industries. It behoves us to keep this point in the forefront of our endeavours in improving our wheats.

Australian wheats have always been celebrated for the production of a flour of good colour, and it may be said that it is on this account alone that they have any special value in the world's markets. They command, however, a much lower price than do the strong-flour wheats, and it is time to consider the matter rationally, and make up our minds to systematically aim at the production of the more valuable varieties.

Fortunately it is beyond question that we can, in Australia, produce grain of the type required, and we can increase the flour-strength without detriment to the colour. This important essential fact being established, it only remains to encourage systematically the cultivation of improved varieties.

A word as to the method of milling, and in explanation of the figures. The milling has been carried out on the small model mill in operation in the laboratory of the Department of Agriculture, Sydney. The method adopted has been directed towards obtaining about 70 per cent. of straight grade flour. In cases where it may have been necessary to treat bran or pollard with undue severity, in order to obtain this percentage, the milling notes will indicate to what extent this has occurred. The figures for the percentage of gluten are obtained by washing the gluten out with water, and drying at 100° C. The figures for strength give the number of quarts of water absorbed by a 200 lb. sack of the flour in order to produce a dough of the proper consistency for baking.

Western Australia.

The Western Australian wheats are a nice looking batch, being good, clean samples, fairly plump and even, and of good bushel-weight. They all give good yields of flour in the mill, and the flour-colour is, in all cases, of the first class. In the matter of flour-strength there is considerable variation, and in the gluten contents some quite remarkable differences.

Judging from the f.a.q. sample, the grain in general cultivation is of weak-flour varieties, and in the matter of colour and strength the f.a.q. flour is very similar to that of the eastern States. It is, however, very much lower in gluten, in which it is, in fact, deficient. The character of the gluten is also peculiar, possessing very little tenacity, so that it is by no means an easy matter to collect it for the purpose of weighing after washing out the starch.

This non-coherent gluten is characteristic of most of the grain in this batch, and is remarkably noticeable in Marshall's No. 3, in which the gluten is very deficient, and the little that there is is of a crumbly nature, without cohesion, and very difficult to collect. Marshall's No. 3 is a grain which, when grown in the other States, is usually fairly rich in gluten of good quality, and of fairly high strength. It has distinctly deteriorated in this instance.

Wheats from Western Australia.

	Appearance of Grain.	Weight per bushel.	Percentage of Milled Products: Flour.	Pollard.	Bran.	Colour of Flour.	Strength of Flour.	Gluten.	Character of Gluten.	Notes.
		lb.								
Marshall's No. 3 ..	Dull white, medium size, fairly plump, medium hard	60½	73·7	9·8	16·5	Excellent	49·6	4·6	Yellowish, very non-coherent.	Bran, fairly clean; pollard, clean; semolina, white, and faintly gritty. Break-flour, 32·8
Dart's Imperial ...	Dull white, medium size, fairly plump, soft	62½	70·4	16·4	13·2	Excellent	49·5	9·7	Yellowish, elastic, coherent	Bran and Pollard, fairly clean; semolina, white and soft. Break-flour, 37.
Marshall's Red Straw	Dull white, fair size, plump, soft.	63¼	72·5	11·0	16·5	Excellent	5[illegible]·0	10·6	Yellowish, elastic, fairly coherent	Bran, fairly clean: pollard, clean: semolina, white and soft. Break-flour, 32·8.
Power's Fife ..	Dull red, small, pinched, hard.	60	70·4	12·0	17·6	Excellent	48·5	9·3	Yellowish, elastic, coherent.	Bran, fairly clean and small; pollard, fairly clean: semolina, slight yellow, and gritty. Break-flour, 20.
Bobs	Translucent, small, round, plump, hard.	62	75·2	12·3	12·7	Excellent	52·0	8·6	Yellowish, non-coherent	Bran and pollard, very clean; semolina, yellowish, and gritty. Break-flour, 36·6.
Jonathan . ..	Translucent, small, round, plump, hard.	61¼	76·3	10·4	13·3	Excellent	55·0	10·4	Slight yellow, elastic, slightly coherent	Bran, small, and very clean, pollard, very clean, semolina, yellow, and gritty. Break-flour, 19·1
Come-back .	Translucent, small, round, plump, hard.	63½	76·1	9·6	14·3	Excellent	5[illegible]·2	9·7	Yellowish, non-coherent	Bran, clean and small: pollard, very clean; semolina, faint yellow, and gritty. Break-flour, 25·2.
Sydney Purple Straw	Dull white, small, slightly pinched, soft.	60¼	71·6	10·5	17·9	Very good	48·5	6·7	Yellowish, non-coherent	Bran, fairly clean, pollard, clean; semolina, white and soft. Break-flour, 39·8.
F.A.Q. (61½ lb.)	Dull white, soft, fairly plump, soft.	60¼	76·5	10·9	12·6	Excellent (rather white)	50·0	7·2	Yellowish, non-coherent	Bran and pollard, very clean; semolina white and soft. Break-flour, 41·1.

On the other hand, Mr. Farrer's strong-flour crosses give excellent results, Come-back being a particularly fine sample of wheat, of attractive appearance. high bushel-weight, and strength. These wheats have not been sufficiently long in cultivation in Western Australia to justify any definite expression of opinion as to their suitability for Western Australian conditions, and it may be that, in a few years' time, the same deterioration in the gluten may result as is noticed in the case of the more generally cultivated varieties.

With the exception of this peculiarity in the gluten, the Western Australian wheats are all first-rate milling samples, giving a flour of exceptionally fine colour --that is to say, very white.

South Australia.

The South Australian samples undoubtedly attain the highest average of excellence as milling wheats.

The types most generally cultivated in South Australia, such as Marshall's No. 3, Gluyas, Carmichael's Eclipse, Petatz Surprise, Dart's Imperial, are all attractive-looking, plump samples of good bushel-weights, yielding a straight-grade flour of first-class baking quality. In strength and gluten-contents they are above the New South Wales wheats and in colour they are just as good, and the f.a.q. sample is the best milling f.a.q. sample of any of the States.

The specimens of Mr. Farrer's strong-flour cross-bred wheats, Bobs and Come-back, hardly do these wheats justice, as they are in all cases more or less shrivelled and pinched and of low bushel-weight. This has also to some extent affected the colour of the flour, which is not as good as is usual with these wheats, but it has had no influence on the gluten-content nor the strength, which in the case of Come-back is remarkably high.

From information supplied by the Secretary for Agriculture, South Australia, we learn that Come-back is a wheat which is becoming very popular in that State and it appears to be particularly suited to South Australian conditions. In New South Wales it has never been grown to any extent. Regarding Bobs we are told that it is not increasing in popularity owing to its propensity to shell.

Federation, the other one of Mr. Farrer's cross breds which have been included in this list, suffers also from being pinched and is very light. It mills, however, in a highly satisfactory manner and yields a much stronger flour than it does in New South Wales, a result, no doubt, of change of climate.

One of the finest samples in this batch is Yandilla King, which is a particularly bright and attractive looking grain. It is also of high bushel-weight and gives extremely good results in the mill. It is a wheat newly introduced into South Australia and is said to be a good yielder. It is a cross between Yandilla and Silver King. The sample contained a little bunt.

Another very attractive wheat is Nhill, a variety recently introduced from Victoria. It has the defect that the flour is extremely weak, indeed it is the only one of the South Australian batch where flour strength is not above the average. It is possible that acclimatisation may improve it in this particular, for there is no doubt that the climate (or the soil) of South Australia favours the production of strong flour.

Wheats from South Australia.

	Appearance of Grain.	Weight per bushel.	Percentage of Milled Products: Flour.	Pollard.	Bran.	Colour of Flour.	Strength of Flour.	Gluten.	Character of Gluten.	Notes.
		lb.								
Dart's Imperial ...	Dull white, large, plump, medium hard.	61	70·8	15·2	14·0	Excellent	50·0	10·8	Slight yellow, elastic, coherent.	Bran, clean; pollard, fairly clean; semolina, faint yellow, and slightly gritty. Break-flour, 30·3.
Marshall's No. 3	Dull white, medium size, plump, medium hard.	61¼	71·6	13·4	15·0	Excellent	51·0	12·6	Yellowish, slightly elastic, non-coherent	Bran and pollard, clean; semolina, white, and slightly gritty. Break-flour, 29·1.
Gluyas	Dull white, medium size, medium hard.	62¼	68·8	15·0	16·2	Excellent	52·0	10·7	Yellowish, very non-coherent (hard to collect).	Bran, large, fairly clean; pollard, fairly clean; semolina, white and soft. Break-flour, 25·2.
Carmichael's Eclipse	Dull white, rather pinched, medium hard.	61½	71·[illegible]	17·2	11·2	Good, rather dark	51·0	12·[illegible]	Yellowish, elastic, coherent.	Bran, rather small and clean; pollard, clean; semolina, white and soft. Break-flour, 14·5.
Petatz Surprise ..	Dull white, medium size, fairly plump, medium hard.	62½	70·3	15·2	14·5	Excellent	54·0	11·8	Greyish, elastic, coherent.	Bran, large, fairly clean; pollard, clean; semolina, white and soft. Break-flour, 28·1.
Neumann's	Dull white, long, fairly plump, soft.	62	71·2	12·9	15·9	Excellent	51·0	11·8	Slightly yellow, elastic, coherent.	Bran, large, fairly clean; pollard, clean; semolina, white and soft. Break-flour, 26.
Yandilla King ...	Translucent, large, plump, hard	63¼	73·0	14·6	12·4	Excellent	51·4	10·8	White, elastic, coherent	Bran and pollard, clean; semolina, white, and slightly gritty. Break-flour, 19.
Nhill ...	Dull white, medium size, plump, medium hard.	62	71·1	13·0	15·9	Excellent	4[illegible]·5	10·1	Slight yellow, slightly elastic, very coherent.	Bran and pollard, clean; semolina, white and soft. Break-flour, 25·7.
Bobs ..	Slightly translucent, small, rather pinched	58¾	71·3	13·8	14·9	Very good, yellow.	55·0	12·3	Yellowish, elastic, coherent.	Bran and pollard, clean; semolina, yellowish and gritty. Break-flour, 20·3.
Come-back	Translucent, small, pinched, hard.	59¾	69·5	19·3	11·2	Very good, pinkish tinge.	5[illegible]·0	12·8	White, elastic, non-coherent	Bran, small, fairly clean; pollard, fairly clean; semolina, white, and slightly gritty. Break-flour, 19·5.
Federation	Dull white, small, pinched, soft.	58½	72·1	13·9	14·0	Excellent	52·4	10·8	Yellowish, coherent, elastic.	Bran, large, fairly clean; pollard, clean; semolina, white and soft. Break-flour, 25·8
F.A.Q. (63 lb.) ..	Dull white, medium size, plump, medium hard.	62	70·6	17·3	12·1	Excellent	54·0	10·4	Yellowish, slightly elastic, non-coherent.	Bran, fairly clean; pollard, clean; semolina, slightly yellow, and slightly gritty. Break-flour, 28·3.

Victoria.

The Victorian grown samples are all first-class milling wheats, of attractive appearance, though with thick bran. They are all of high bushel-weight and yield their flour readily and abundantly. The grain is soft and of the weak-flour type, the f.a.q. sample yielding flour rather below the average strength of Australian flour. In colour and gluten-content the f.a.q. flour is first-class.

The samples of Dart's Imperial are fine-looking grain, especially that grown in the Mallee; the sample from Goulburn Valley District is slightly bunty and contains some black oats. They are both fine milling wheats, though yielding rather weak flour.

The sample named "Mallee Wheat" is also a good milling sample. This wheat is not named, but we are told that it is probably Steinwedel. It behaves in the mill in a similar manner to Steinwedel, but it does not quite resemble that grain in appearance. Port McDonnell is also a good milling sample, though it has the disadvantages that the flour is of hardly so high a colour as the others and slightly too rich in gluten. It appears to be a mixture of two different grains.

New South Wales.

The samples representing New South Wales wheat are unnamed (see Table, p. 303) and classified according to their districts. They were obtained from the Sydney Chamber of Commerce and are representative of the samples obtained for the purpose of arriving at the f.a.q. standard for last season. They are, therefore, essentially typical of the grain grown in the different districts of the State, but afford no indication of the characteristics of any special varieties. They are largely made up of grain of similar nature, among which Steinwedel and Farmers' Friend probably largely predominate.

The best individual sample is that from Henty, and this was chosen because it was the finest sample sent in for the purpose of taking the average. It was not taken into account in striking the average as it was of very much higher bushel-weight than the other samples in a season when the bushel-weight was rather low. It was a bright, clean, and particularly attractive looking grain. The grain from the Southern and Western districts are also nice-looking samples, and very similar both in their appearance and their behaviour in the mill.

The North-Western and the Northern samples are not quite so good.

Speaking generally, the characteristics of New South Wales wheat are exhibited in the f.a.q. sample. It is a nice, attractive looking grain, plump, and free from bunt and foreign admixture, of fairly good bushel-weight. It is very easy to mill, and yields readily a good percentage of straight-grade flour. The flour is almost invariably of the very highest colour, which is its principal strong point. In strength it is rather low, which is its chief defect. The tendency in New South Wales is undoubtedly in the direction of the cultivation of strong-flour wheats, and some of these are being grown extensively and are coming rapidly into popularity; but when an average is struck, representing large areas, as has been done in this instance, the

WHEATS from Victoria.

	Appearance of Grain.	Weight per bushel.	Percentage of Milled Products: Flour.	Pollard.	Bran.	Colour of Flour.	Strength of Flour.	Gluten	Character of Gluten.	Notes.
		lb.								
Steer's Early Purple Straw (grown at Castlemaine).	Medium, translucent, fair size, plump, soft.	62¼	69·3	14·0	16·4	Good: greyish tinge.	49·5	11·1	White, coherent, elastic	Bran, large, not very clean: pollard, fairly clean: semolina, white and soft. Break-flour, 24·7.
Dart's Imperial (grown at Kerang, Mallee).	Medium, translucent, large, plump, soft.	63¾	73·8	13·3	12·9	Excellent	47·5	9·2	Slight, yellow, very coherent, elastic.	Bran, large and clean; pollard, clean; semolina, white and soft. Break-flour, 30·9.
Dart's Imperial (grown at Tabelk, Goulburn Valley).	Medium, translucent, large, plump, soft.	63·0	70·5	17·9	11·6	Excellent	46·0	10·3	Slight, yellow, very coherent, elastic.	Bran and pollard, fairly clean; semolina, white and soft. Break-flour, 22·5.
Mallee Wheat (grown at Berrewellock).	Dull white, rather small, plump, soft.	61¼	69·1	15·4	15·5	Excellent	49·0	10·7	Slight, yellow, very coherent, elastic.	Bran, very large, and fairly clean; pollard, clean; semolina, white and soft; break-flour, 23·5.
Port McDonnell (grown at Kyneton).	Mixed, some dull white, some translucent, medium size, plump, medium hardness.	63¾	70·5	16·7	12·8	Good, greyish tinge	48·4	9·0	Slight, yellow, coherent, elastic.	Bran and pollard, fairly clean; bran, large; semolina, white and soft. Break-flour, 30·9.
F.A.Q. (63 lb.) ...	Dull white, medium size, fairly plump, soft.	61½	70·0	13·9	16·1	Excellent	48·0	10·6	Slight, yellow, coherent, elastic.	Bran, large, fairly clean; pollard, clean; semolina, white and soft. Break-flour, 30·4.

dominant wheats are weak-flour ones. At the same time, the flour-strength is considerably higher than it was six or seven years ago. The gluten content is satisfactory, and they are all first-class milling-wheats of the weak-flour type.

Queensland.

The wheats from Queensland (see Table, p. 304) are all plump, nice-looking, clean grain, of high bushel-weights. Free's Abundance is a particularly attractive sample, and is very heavy. There was a little barley and oats in Baltic Red and Allora Spring, and Marshall's No. 3 had weevils, but otherwise the samples were all clean and fairly even grain.

They all mill very satisfactorily, giving plenty of flour of first-rate colour and fairly rich in gluten. The strength is about the average for weak-flour wheats, Imperial Pearl being the only one which possesses the characteristics of strong-flour wheats, namely a fairly hard grain giving gritty semolinas, and yielding a flour of fairly high strength. The sample of Manitoba, though similar in appearance to the Fife wheats, does not possess their strong-flour characteristics, and is not the same wheat to which we are accustomed in New South Wales under that name. The flour, though of medium strength, is soft and velvety to the touch instead of being gritty, and the semolinas are white and soft. The grain itself though small and red, and fairly hard, is mealy instead of being horny. Baltic Red might also be mistaken for a Fife wheat from its external appearance, but the grain is soft with a mealy interior and yields an extremely weak flour.

Free's Abundance, Budd's Early, Allora Spring, Newman's and Marshall's No. 3 are all nice samples. The flour from Marshall's No. 3 is not quite so strong or rich in gluten as from the same variety grown in South Australia.

New Zealand.

The New Zealand wheats form a very characteristic group (see Table, pp. 306 and 307), and are quite different to anything we are accustomed to on the Australian continent. They are throughout of good, often of high bushel-weight, and are plump, well-filled grain, but they are dull in appearance, with thick bran, and are not attractive samples.

Hunter's White, Velvet, and Pearl are all small round grain which pack well in the bushel and give high bushel-weight. In many samples the grain is mixed in colour, there being a mixture of red and white grains, the white predominating. The colour of the flour obtained from these wheats is in all cases disappointing, and there are very few that can be called first-class. They all have a more or less starchy or chalky appearance. This is no doubt owing to the fact that the gluten-content is low. This deficiency in gluten is the most striking defect in the New Zealand wheats.

The wheats are weak-flour wheats, the flour strength being about the average for their class, and about what we are accustomed to in New South Wales; the gluten, though low in amount and generally not of very good colour, is of good quality, elastic and not particularly sticky.

Speaking generally, the New Zealand samples are heavy, plump-looking grain, free from bunt and generally clean. The bran is rather thick, and the

WHEATS from New South Wales.

	Appearance of Grain.	Weight per bushel.	Percentage of milled products.			Colour of Flour.	Strength of Flour.	Gluten.	Character of Gluten.	Notes.
			Flour.	Pollard.	Bran.					
Southern Districts ..	Dull white, medium size, plump, medium hard.	61¼	68·2	16·6	15·2	Excellent ...	50·6	9·5	White, elastic, coherent	Bran and pollard, fairly clean; semolina, white and soft. Break-flour, 28·7.
Western Districts (Bathurst, Orange, Trangie, Molong).	Dull white, medium size, plump, medium hard.	61½	69·1	14·8	16·1	Excellent ..	50·0	9·7	Slight yellow, elastic, coherent.	Bran and pollard, fairly clean; semolina, white and soft. Break-flour, 26·1.
North Western Districts (Warialda, Gunnedah).	Dull white, medium size, fairly plump, soft.	60¼	71·0	13·2	15·8	Excellent ..	48·0	11·9	Slight yellow, elastic, coherent.	Bran and pollard, clean; semolina, white and soft. Break-flour, 28·5.
Northern Districts ..	Dull white, medium size, fairly plump, soft.	59½	72 5	13·1	14·4	Excellent ..	48 4	10·5	Yellowish, elastic, coherent.	Bran and pollard, clean; semolina, white and soft. Break-flour, 30·2.
Henty	Dull white, large plump, medium hard.	62¼	69 3	17 7	13·0	Excellent .	46 0	9 5	Yellowish, elastic, and coherent.	Bran and pollard, fairly clean; semolina, white and soft. Break-flour, 28·5.
Cowra and Grenfell ..	Dull white, medium size, plump, medium hard.	60½	69 0	14·2	16·8	Excellent .	45·6	10·1	Yellow, elastic, coherent	Bran and pollard, fairly clean; semolina, white and soft. Break-flour, 23·2.
F.A.Q. (62) lb. per bushel.	Dull white, medium size, fairly plump, soft.	61·0	71·1	15 2	13·7	Excellent ..	50·0	10 8	Yellowish, coherent, elastic.	Bran and pollard, fairly clean; semolina, white and soft. Break-flour, 33·1.

Wheats from Queensland.

	Appearance of Grain.	Weight per bushel.	Percentage of Milled Products: Flour.	Pollard.	Bran.	Colour of Flour.	Strength of Flour.	Gluten.	Character of Gluten.	Notes.
Budd's Early .. .	Fairly translucent, medium size, plump, soft.	64½	73·6	11 3	15 1	Excellent	47	11·0	Bright yellow, elastic, coherent.	Bran, very large, clean: pollard, clean; semolina, white and gritty. Break-flour, 24·9.
Newman's Early ..	Dull white, long, fairly plump, soft.	61¾	69 7	14 7	15·8	Excellent, rather white.	49	8 4	Slightly yellow, elastic, coherent.	Bran and pollard, fairly clean; semolina, white and soft. Break-flour, 24 9.
Imperial Pearl	Medium translucent, medium size, plump, fairly hard.	62¾	74·5	11·3	14 2	Excellent	52 6	13·0	Yellowish, coherent, elastic.	Bran, very clean, and fairly large; pollard, very clean, semolina, white, and slightly gritty. Break-flour, 26·2.
Leatherhead	Medium translucent, medium size, plump, medium hard.	63¾	70·1	15·5	14·4	Very good, rather chalky.	46 0	8 3	Slightly yellow, elastic, coherent.	Bran, fairly clean, and very large; pollard, fairly clean; semolina, white and soft. Break-flour, [illegible]7.
Allora Spring	Dull white, small, round, plump, soft.	63	72 7	14 2	13 1	Excellent	48 0	9 6	Bright yellow, coherent, elastic	Bran and pollard, clean; semolina, slightly yellow and gritty. Break-flour, 23·9.
Marshall's No. 3 ..	Medium translucent, large, plump.	62¼	74·7	11·9	13 4	Excellent ..	50·0	9·5	Slight yellow, coherent, elastic	Bran and pollard, clean; semolina, white and slightly gritty. Break-flour, 22·0
Carmichael	Bright yellow, roundish, plump, soft.	64½	73·6	14·2	12·2	Excellent .	50·2	11 2	Yellow, elastic, coherent	Bran and pollard, clean; semolina, white and soft. Break-flour, 27·2.
Free's Abundance .	Medium translucent, fair size, plump, medium hardness.	65½	69 3	15 1	15·6	Excellent .	47·0	12·1	Slightly yellow, elastic, very coherent.	Bran, fairly clean; pollard, clean: semolina, white and soft. Break-flour, 25 9.
Manitoba	Dull red, small, pinched, hard.	62	70·4	15·7	13 9	Excellent, yellow tip.	52	12 6	Slightly yellow, elastic, very coherent.	Bran, small, fairly clean; pollard, clean; semolina, white and soft. Break-flour, 24·9.
Baltic Red	Dull red, small, soft	63½	72·2	18·5	9·8	Very good ..	47·4	8·6	Yellow, coherent, elastic.	Bran, small, fairly clean; pollard, clean; semolina, white and soft. Break-flour, 35.

grain somewhat dull and wanting in bloom. The wheats mill easily and yield flour readily and abundantly. The flour is of the weak-flour type, but fairly strong for the type. It is very deficient in gluten, and inclined on this account to be chalky in colour.

Tuscan.—The wheats sent under this name are generally fairly large, well-filled plump grain of good bushel-weight, deficient in brightness and bloom. Those grown in the South Island are of higher bushel-weight to those of the North Island, and the colour of the flour is superior. The best samples are from Nelson and Ashburton districts. The Tuscan wheats are on the whole rather higher in gluten-content than the other varieties, one or two samples being fairly rich in gluten. It appears to be a prolific variety, the sample of white Tuscan from Wanganui being taken from a harvest of 68 bushels per acre, and had been grown twenty years on the same farm, and the sample of ordinary Tuscan from Wanganui (No. 2) being part of a crop giving 41 bushels to the acre.

Hunter's White is a small, rather round grain, of high bushel-weight, soft and mealy interior.

Pearl and *Velvet* are very similar in appearances. They are small round grains, rather rounder than Hunter's White, and are almost circular. The sample of Velvet from Oamaru is the best-looking sample of the batch, being bright and clear-skinned, and of very attractive appearance. It is also one of the best milling wheats sent, and gives by far the strongest flour.

Talavera is a very different grain to that which we know under the name on the mainland. It is a grain of very dull appearance and extremely thick bran, yielding a very weak flour remarkably deficient in gluten.

Summarising briefly the more salient good and bad points which characterise the wheats produced in the various States, we may say that the South Australian wheats are pre eminent for flour-strength, premising that the Australasian wheats, as a class, are weak-flour wheats.

The flour of the South Australian wheats is also always of high colour and good gluten content.

The Victorian wheats produce flour of equally good colour and gluten content, but are lower in strength, and the New South Wales flour very closely resembles the Victorian and South Australian, and stands midway between them in respect to strength.

The Queensland wheats are characterised by high bushel weights, ease with which high percentage of flour is milled. The colour of the flour is as good as in the case of the above three States, but the flour-strength is distinctly lower.

In Western Australia the typical grain gives a flour of high colour and of fair strength, but deficient in gluten.

From New Zealand we get a class of grain which is quite unlike that to which we are accustomed on the continent. Its good points are its prolificness, high bushel-weight, and fair flour-strength. Its bad points are lack of brightness in the grain, thick bran, chalky colour of flour, and deficiency in gluten.

Note.—No comparison is intended between the wheats of the different States. Indeed, no such comparison is possible, except in the case of the F.A.Q. samples, since the samples examined are, in some cases, of special and newly introduced varieties which are not in general cultivation, and in others represent the type grown in a particular locality and are unnamed and frequently mixtures.

Wheats from New Zealand.

	Appearance of Grain.	Weight per Bushel.	Percentage of Milled Products: Flour.	Pollard.	Bran.	Colour of Flour.	Strength of Flour.	Gluten.	Character of Gluten.	Notes.
1. Tuscan .. . (Palmerston, Nelson District).	Mixed, white and brown, large, plump, soft.	63¼	73·2	12·1	14·7	Very good	52 4	11·3	White, elastic, coherent	Bran, very large, fairly clean; pollard, clean: semolina, white and soft; flour clings to bran. Break-flour, 31 8.
2. Tuscan ... . (Wanganui District).	Mixed, white and brown, large, plump, soft.	64	72·7	9·2	18·1	Good, rather starchy.	51·0	9 2	Yellowish, slightly coherent, slightly elastic.	Bran, large and clean; pollard, clean; semolina, white and soft. Break-flour, 34 8.
3. White Tuscan .. (Wanganui District).	Mixed, white and brown, medium size, plump, medium hard.	64¾	74·4	11·1	14·5	Very good, starchy.	51·0	8 3	Yellowish, and very non-coherent.	Bran and pollard, very clean; semolina, white and soft. Break-flour, 26·5.
4. Brown Tuscan ... (Wanganui District).	Mixed, white and brown, large, plump, soft.	63¾	75·5	13·3	11·2	Very good, rather starchy.	51·0	10·2	Yellowish, slightly elastic, slightly coherent.	Bran, very clean and large; pollard, clean; Semolina, white and soft. Break-flour, 37 7.
5. Red Tuscan .. .. (Wairarapa District).	Mixed, white and brown, large, plump, soft.	61½	70·5	10·5	19·0	Excellent .	51·8	8·5	Dark, and very non-coherent.	Bran, fairly large and clean; pollard, fairly clean; semolina, dull white and soft. Break-flour, 30·1.
6. Tuscan ... ... (Nelson District).	Dull white, large, fairly plump, fairly hard.	64¼	74 3	9·7	16·0	Very good, rather starchy.	46 5	8·1	Greyish, non-elastic, adhesive.	Bran, large, fairly clean: pollard, clean; semolina, white and soft. Break-flour, 29 4.
7. Tuscan ... .. (Canterbury District).	Mixed, white and brown, medium size, plump, soft.	65	71·1	15 5	13·4	Excellent, whitish.	48·0	7·8	Slightly yellowish, very slightly elastic, coherent.	Bran, clean and large; pollard, clean; semolina, white and soft, Break-flour, 34 6.
8. Tuscan ... . (Ashburton District).	Dull white, large, plump, soft.	65¼	72·9	13·2	13·9	Excellent, whitish.	51·5	7 3	Dark, non-elastic, non-coherent.	Bran, clean and large; pollard, clean; semolina, white and very slightly gritty. Break-flour, 42·3.
9. Solid Straw Tuscan (Ashburton District).	Dull brown, large, plump, fairly hard.	65½	70·1	17 7	12·2	Excellent, whitish.	51·4	8·7	Slightly yellow, very slightly coherent and elastic.	Bran, large and fairly clean; pollard, fairly clean; semolina, white and very slightly gritty. Break-flour, 38·3.

WHEATS from New Zealand—*continued*.

	Appearance of Grain.	Weight per Bushel.	Percentage of Milled Products: Flour.	Pollard	Bran.	Colour of Flour	Strength of Flour.	Gluten.	Character of Gluten.	Notes.
10. Hunter's White .. (Nelson District).	Dull white, round, plump, soft.	63	74·1	10·1	15·8	Good, whitish	49·0	8·[illegible]	Slightly yellow, elastic, coherent.	Bran, clean and large; pollard, clean; semolina, white and soft. Break-flour, 30·3.
11. Hunter's White (Canterbury District).	Mixed, white and brown, small, round, plump, soft.	62½	[illegible]9·9	15·2	14·9	Rather starchy.	48·5	7·3	Poor colour, non-elastic non-coherent.	Bran, clean, fairly large; pollard, fairly clean; semolina, white and soft. Break-flour, 33·3.
12. Hunter's White (Ashburton District).	Mixed, white and brown, small, plump, fairly hard.	63½	69·8	14·5	15·7	Very good, rather starchy	51·0	7·4	Yellowish, coherent, elastic.	Bran, fairly clean: pollard, clean: semolina, white and soft. Break-flour, 30·2.
13. Pearl ... .. (Wairarapa District).	Mixed, white and brown, small, round, plump, soft.	61½	70·6	13·4	16·0	Very good, rather chalky.	49·4	6·5	Dark colour, non-coherent.	Bran, fairly large and clean: pollard, fairly clean: semolina, white and soft. Break-flour, 27·8.
14. Pearl .. (Canterbury District).	Mixed, white and red small, round, plump, soft.	62	72·1	11·2	16·7	Excellent, whitish tinge.	48·5	8·3	Yellow, non-coherent, non-elastic.	Bran, clean, fairly large; pollard, fairly clean; semolina, white and very slightly gritty. Break-flour, 35·3.
15. Pearl .. (Ashburton District).	Dull white, small, round, plump, soft.	64	73·8	10·5	15·7	Excellent	49·0	7·8	Slightly yellow, slightly coherent, slightly elastic.	Bran, large and clean; pollard, clean; semolina, white and soft. Break-flour, 40.
16. Velvet... ... .. (Ashburton District).	Dull, white, small, round, plump.	64	73·3	10·1	16·6	Excellent	52·0	8·0	Faint yellow, slightly elastic, slightly coherent.	Bran, large and clean: pollard, clean: semolina, white and soft. Break-flour, 36·5.
17 Velvet... ... .. (Oamaru District).	Dull white, small, round, plump, fairly hard.	64	74·8	10·6	14·6	Very good	56·0	9·4	Slightly yellow, non-coherent.	Bran, very clean and large; pollard, very clean; semolina, white and slightly gritty. Break-flour, 25·6.
18. Talavera ... (Ashburton District).	Dull white, large, plump, soft.	62¼	72·0	10·[illegible]	17·4	Very good, rather starchy.	47·0	6·8	Yellowish, coherent, elastic.	Bran, very large and clean; pollard, clean; semolina, white and soft. Break-flour, 30·2.

Forestry.

Some Practical Notes on Forestry suitable for New South Wales.

[Continued from p. 1084, Vol. XVII.]

J. H. MAIDEN,
Government Botanist and Director of the Botanic Gardens, Sydney.

XVII.

Conifers.

I.

I now propose to give lists of plants suitable for cultivation in New South Wales, but it is obvious that in the first place we must endeavour to obtain a settled nomenclature. In no group of plants is the nomenclature more unsettled than in the Coniferæ.

I give a list of the genera from three works:—

1. Eichler, in Engler's "Nat Pflanzenfamilien." (1889.)
2. Engler's "Syllabus der Pflanzenfamilien." (1898.)
3. Veitch's "Manual of the Coniferæ," by Adolphus H. Kent. (1900.)

It will be observed that Veitch's Tribe Salisburineæ is partly Engler's Taxeæ of the Family Taxaceæ.

Veitch's Tribe Taxineæ is Engler's Family Taxaceæ with Salisburineæ excluded.

Eichler divides the Family Coniferæ into the two Sub families Pinoideæ and Taxoideæ.

Engler calls Coniferæ a "Class" (abolishing the old name Natural Order for it), and divides it into two Families, Taxaceæ and Pinaceæ.

There are some minor differences of sequence in the three schemes.

I believe that, in a few years, the three classifications will fall into line.

For the purpose of the present work, I think it will be a convenience to English readers if the classification of Veitch's Manual be employed almost in its entirety. I hope that we shall have a Conifer Conference shortly to determine nomenclature as far as it is possible to attain finality in a case like this.

Eichler (*Nat. Pflanzen-Familien* ; 1889).

Family.—**CONIFERÆ.**

Sub-family I.—PINOIDEÆ.

Tribe I.—ABIETINEÆ.

Sub-tribe 1.—*Araucariinæ.*

1. Agathis.
2. Araucaria.

Sub-tribe 2.—*Abietinæ.*

3. Pinus.
4. Cedrus.
5. Larix.
6. Pseudolarix.
7. Picea.
8. Tsuga.
9. Abies.

Sub-tribe 3.—*Taxodiinæ.*

10. Sciadopitys.
11. Cunninghamia.
12. Athrotaxis.
13. Sequoia.
14. Cryptomeria.
15. Taxodium.
16. Glyptostrobus.

Tribe II.—CUPRESSINEÆ.

Sub-tribe 1.—*Actinostrobinæ.*

17. Actinostrobus.
18. Callitris.
19. Fizroya.

Sub tribe 2.—*Thujopsidinæ.*

20. Thujopsis.
21. Libocedrus.
22. Thuja.

Sub-tribe 3.—*Cupressinæ.*

23. Cupressus.
24. Chamæcyparis.

Sub-tribe 4.—*Juniperinæ.*

25. Juniperus.

Sub-family II.—TAXOIDEÆ.

Tribe I.—PODOCARPEÆ.

26. Saxegothæa.
27. Microcachrys.
28. Podocarpus.
29. Dacrydium.

Tribe II.—TAXEÆ.

30. Phyllocladus.
31. Ginkgo.
32. Cephalotaxus.
33. Torreya.
34. Taxus.

Engler's *Syllabus der Pflanzenfamilien* (1898).

Class.—**CONIFERÆ.**

Family TAXACEÆ.

Tribe I.—PODOCARPEÆ.

1. Saxegothœa.
2. Microcachrys.
3. Podocarpus.
4. Dacrydium.

Tribe II.—TAXEÆ.

5. Phyllocladus.
6. Ginkgo.
7. Cephalotaxus.
8. Torreya.
9. Taxus.

Family PINACEÆ.

Tribe I.—ARAUCARIEÆ.

1. Agathis.
2. Araucaria.

Tribe II.—ABIETINEÆ.

3. Larix.
4. Pseudolarix.
5. Cedrus.
6. Pinus.
7. Picea.
8. Tsuga.
9. Pseudotsuga.
10. Abies.

Tribe III.—TAXODIEÆ.

11. Sciadopitys.
12. Cunninghamia.
13. Sequoia.
14. Arthrotaxis.
15. Cryptomeria.
16. Taxodium.
17. Glyptostrobus.

Tribe IV.—CUPRESSINEÆ.

Sub-tribe 1.—*Actinostrobinæ.*

18. Actinostrobus.
19. Callitris.
20. Fitzroya.

Sub-tribe 2.—*Thujopsidinæ.*

21. Thujopsis.
22. Libocedrus.
23. Thuja.

Sub-tribe 3.—*Cupressinæ.*

24. Cupressus.
25. Chamæcyparis.

Sub-tribe 4.—*Juniperinæ.*

26 Juniperus.

We have thus two large Families, the *Taxaceæ*, with usually a fleshy fruit enclosing a single seed, and greatly resembling a drupe (the fruit of a cherry is a familiar form of drupe), and the *Coniferæ* proper, with dry, woody scales and numerous seeds which make up the fruit of this section. A Pine-cone is a typical example of the true Coniferæ, but the fruits of Coniferæ are not all cone-shaped.

The so-called berries (galbuli) of the Juniper have a superficial resemblance to the fruits of Taxads, but structurally they conform to the strobiles or fruits of the Coniferæ, the confluent scales being fleshy or succulent, instead of ligneous.

The work I have chiefly consulted in the compilation of these notes is the 2nd Edition of Veitch's "Manual of the Coniferæ," which Dr. Maxwell T. Masters personally and warmly recommended to me. Dr. Masters is the greatest British authority on Coniferæ, and one of the foremost in the world, so that his writings should also be referred to in points of doubt. A defect of the book to Australians lies in the fact that, as a very general rule, only those Taxads and Conifers are dealt with which are hardy in Great Britain and Ireland. An index list of all Coniferæ would be desirable.

For American Conifers, the work of the greatest dendrologist of that continent, Prof. C. S. Sargent, has been often quoted. The references "Sargent, t. 600" (as the case may be) refer to the beautiful illustrations in his monumental "Silva of North America."

As regards Japanese Conifers, Andrew Murray's "The Pines and Firs of Japan" (1863) will be found valuable, if only for its excellent illustrations.

The "Botanical Retrospect" given at pp. 102–105 of Veitch's Manual is valuable.

Veitch's *Manual of the Coniferæ* (1900).

TAXACEÆ.

"Trees or shrubs with homomorphic, rarely dimorphic, ramification. Leaves persistent, rarely deciduous. Staminate flowers composed of numerous stamens arranged in a globose head or cylindric spike. Ovuliferous flowers composed of few or several imbricated scales that are membraneous or become fleshy, never ligneous. Ovules erect or pendulous, surrounded at the base by a fleshy, rarely desiccate arillus, which wholly or in part encloses the ripe seed; rarely exarillate. Maturation of fruit annual, rarely biennial." P. 107.

Tribe—SALISBURINEÆ.

Flowers diœcious, rarely monœcious. Stamens numerous. Ovules erect.

Branchlets dimorphic. Leaves deciduous.
Staminate flowers umbellate ... ... 1. *Ginkgo.*
Branchlets homomorphic. Leaves persistent.
Staminate flowers crowded; stamens capitate .. ... 2. *Cephalotaxus.*
Staminate flowers solitary; stamens spicate .. . 3. *Torreya.*

Tribe—TAXINEÆ.

Flowers monœcious or diœcious. Seed enclosed in a dry testa with or without a fleshy arillus.

Sub-tribe 1.—*Taxeæ.*

Ovules erect or ultimately becoming so.
Ovuliferous flowers perulate.
Branchlets leaf-like, entire or lobed. Leaves on adult plant squamiform, deciduous ... ... 4. *Phyllocladus.*
Branchlets terete. Leaves homomorphic, persistent .. 5. *Taxus.*
Ovuliferous flowers without perulæ.
Branchlets terete, often much subdivided. Leaves heteromorphic ... ... 6. *Dacrydium.*

Sub-tribe 2.—*Podocarpeæ.*

Ovules inverted or ultimately becoming so
Peduncle and bracts concrescent and fleshy. Leaves heteromorphic ... ... 7. *Podocarpus.*
Peduncle ligneous.
Fruits solitary or loosely spicate. Leaves linear .. ... 8. *Prumnopitys.*
Fruits aggregated.
Flowers monœcious. Leaves linear and spirally arranged 9. *Saxegothæa.*
Flowers diœcious. Leaves squamiform, four-ranked ... 10. *Microcachrys.*

CONIFERÆ.

"Trees or shrubs, with resinous secretions and homomorphic, rarely dimorphic, ramification. Leaves persistent, occasionally deciduous. Staminate flowers composed of numerous stamens arranged in close-set spirals around a common axis. Seminiferous flowers composed of a central axis on which the ovuliferous scales are inserted spirally or in decussate pairs, rarely in whorls of three; scales made up of two parts, the bract which is free, adnate at the base, or concrescent, and the seminiferous ligneous, rarely fleshy, lamina bearing two or more erect or pendulous ovules. Seeds 2–9, winged or without wings, and destitute of an arillus."—(Veitch's *Manual of Coniferæ*, 2n Ed., p. 163.)

Tribe—CUPRESSINEÆ.

Flowers monœcious, rarely diœcious. Stamens in decussate pairs or in whorls of three. Scales of the mature strobiles (fruits) opposite or whorled, rarely sub-spirally arranged, consisting of two parts although apparently simple, the bract being concrescent with the scale except at the apex. Ovules erect, 1–9 in one–two series.

Sub-tribe 1.—*Juniperinæ.*

Scales of strobiles (galbuli) concrescent and becoming fleshy.
  Leaves homo- or dimorphic, in whorls of three or in decussate pairs. Staminate flowers axillary or terminal ... 1. *Juniperus.*

Sub-tribe 2.—*Thuinæ.*

Scales of strobiles ligneous in decussate pairs. Branchlets flattened or angulate. Foliage dimorphic; primordial leaves free and spreading; adult leaves squamiform, appressed or more or less concrescent. Scales of strobiles in decussate pairs or sub-spirally arranged.
  Flowers diœcious, uppermost scales only of the strobiles fertile ... ... 2. *Fitzroya.**
  Flowers monœcious, scales of strobiles thickened.
    Scales of strobiles horizontal at the base, with a peltate expansion, and bearing two or more seeds ... ... 3. *Cupressus.*
    Scales of strobiles ascending, oblong or broadly clavate.
      Scales 8–12, more or less imbricated; seeds winged or wingless ... ... 4. *Thuia.*
      Scales 4–6, valvate, the middle or largest pair only fertile; seeds with an oblique wing at the apex... ... ... 5. *Libocedrus.*

Tribe—TAXODINEÆ.

Flowers monœcious, on different branches. Staminate flowers solitary, spicate, paniculate or umbellate; terminal or axillary; stamens spirally crowded. Scales of strobiles spirally arranged and composed of two structures at first distinct, the ovuliferous scale and a bract-like appendage which coalesces with it and becomes obliterated in the mature ligneous, seed-bearing scale. Ovules 2–9, erect or inverted.

Leaves homo- or heteromorphic, persistent.
  Staminate flowers solitary.
    Anther cells, 2. Strobiles globose, with the scales ascending, subacuminate at the apex.
    Seeds 3-6, pendulous ... ... 6. *Athrotaxis.*
  Staminate flowers spicate.
    Anther cells, 3-5. Strobiles globose, with the scales ascending, sub-peltate, and acutely lobed at the apex.
    Seeds 4-5, erect ... ... 7. *Cryptomeria.*
    Anther cells, 2-5. Strobiles cylindric, with the scales horizontal and thickened into a rhomboidal apex with a transverse depression at the centre.
    Seeds 5-7, pendulous ... . 8. *Sequoia.*
Leaves homo- or dimorphic, deciduous.
  Staminate flowers paniculate or solitary.
    Anther cells, 4-8. Strobiles globose or obovoid, with the scales imbricated, rugose, and obscurely mucronate
    Seeds 2, erect ... ... 9. *Taxodium.*

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* Callitris is here omitted. Referred to later in the series.

Leaves dimorphic, squamiform and cladodiform (*i.e.*, deciduous scale-like leaves and persistent leaf-like structures that perform the functions of foliation).
  Staminate flowers umbellate.
    Anther cells, 2. Strobiles ovoid-cylindric, the scales imbricated with a transverse ridge beyond the middle and not thickened at the apex.
    Seeds 7–9, erect ... ... 10. *Sciadopitys.*

Tribe—ARAUCARINEÆ.

Flowers monœcious or diœcious. Staminate flowers umbellate or solitary, terminal or axillary. Stamens mostly pendulous and free, with 3–12 or more longitudinally dehiscent anther cells. Cones with the scales spirally arranged, in the twofold structure of which the bract greatly predominates; the ovuliferous scale confluent and reduced to an inconspicuous cellular projection. Seeds pendulous, free or concrescent with the scale.

Flowers monœcious.
  Staminate flowers umbellate and terminal.
    Seeds 3, pendulous and free ... . 11. *Cunninghamia.*
  Staminate flowers solitary and axillary.
    Seeds solitary, free ... ... 12. *Agathis.*
Flowers diœcious, rarely monœcious.
  Staminate flowers solitary or clustered.
    Seeds solitary, concrescent with the scale ... ... 13. *Araucaria.*

Tribe—ABIETINEÆ.

Flowers monœcious. Staminate flowers terminal or axillary, solitary or spicate, often densely clustered, rarely umbellate. Stamens spirally crowded; anther cells, 2; dehiscence longitudinal, rarely transverse. Scales of fruit-cones spirally arranged, and consisting of two structures, the bract and seed-scale or sporophyll, the former more or less free or concrescent. Seeds 2, inverted.

Sub-tribe 1.—*Pineæ.*

Fruit-cones maturing in two, rarely in three, years. Leaves dimorphic, the primordial scattered; the secondary fascicled, persistent .. .. 14. *Pinus.*

Sub-tribe 2.—*Lariceæ.*

Branchlets dimorphic, the one elongated, with the leaves scattered and inserted on cortical outgrowths (pulvini); the other arrested or "spur-like," with the leaves fascicled.
  Fruit-cones maturing in one year. Leaves deciduous.
    Staminate flowers solitary, seed-scales persistent ... 15. *Larix.*
    Staminate flowers umbellate, seed-scales deciduous... 16. *Laricopsis.**
  Fruit-cones maturing in two years. Leaves persistent.
    Staminate flowers solitary, seed-scales persistent ... 17. *Cedrus.*

Sub-tribe 3.—*Sapineæ.*

Leaves persistent, for the most part homomorphic, and inserted on cortical outgrowths or pulvini decurrent from their base.
  Fruit-cones maturing in one year.
Leaves sessile or very shortly petiolate, angulate or flat, with 1–2 lateral resin canals. Cones often large and pendulous; scales persistent ... ... 18. *Picea.*
Leaves petiolate, flat, with a central resin canal. Cones small and pendulous; scales persistent ... ... 19. *Tsuga.*

* Pseudolarix. Referred to later in the series.

Leaves flat, with two lateral resin canals. Staminate flowers solitary or umbellate. Cones pendulous (or erect); scales persistent ... ... 20. *Abietia.**
Leaves flat, rarely angulate, with two lateral resin canals. Cones large and erect; scales deciduous ... ... 21. *Abies.*

Personally, I am very fond of Conifers, and it is a matter of regret to me that the Sydney climate is not suitable to many which possess aromatic foliage, whose refreshing odour appears to be best developed in cold countries. At the same time, Conifers should be grown in this State in very much greater variety than at present. *Pinus insignis* is grown by tens of thousands, and it is admittedly a useful tree, but growers should be willing to give greater variety to their plantings; and, to meet this, our nurserymen are willing to meet a demand. It is with the twofold view of stimulating a desire for the cultivation of Conifers in New South Wales, and of presenting the modern nomenclature for an over-named family of plants, that this imperfect sketch has been prepared.

Only those Conifers likely to flourish in some part or other of New South Wales have been included. But acclimatisation work is full of surprises; and I hope many surprises, as far as Conifers are concerned, are in store for us in New South Wales.

Many Conifers will be grown purely for ornamental purposes, as specimen trees. These will be given plenty of room, in order that their branches may spread out, and that each individual plant may live its life without dominance or interference by any other vegetation.

For shelter belts the trees will be planted rather thickly. In planting for timber, the trees are planted in regular rows at a distance apart determined by the situation and the nature of the tree, in order that lateral branches, which produce the "knots" of timber, particularly objectionable in the Coniferæ, which yield the timber most generally known as "Pine" of one sort or another, may be eliminated,—may atrophy during the struggle of the forest after the light.

I have had a good deal of difficulty in getting suitable photographic illustrations; I intend to publish others as I receive them. Will correspondents help and will they send me photographs of well grown trees whether Conifers or not for succeeding chapters?

I am desirous of keeping a record of the introduced Conifers which flourish in various parts of this State. I shall, therefore, esteem it a great favour if correspondents will favour me with twigs (bearing cones, if possible) of any Conifers in their districts, with particulars as to size of shrub or tree, and a statement as to suitability for a particular climate and soil.

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* Should be *Pseudotsuga*, for reasons stated later in the series. *Keteleeria* is, in the opinion of some authorities, a distinct genus.

(To be continued.)

Wheats and Frost.

R. W. PEACOCK.

The effect of frost upon the wheat crops throughout the State during the past season has been disastrous. The appearance of the crops before harvesting gave promise of a record yield throughout the State. When harvesting commenced, it was soon apparent that the yields would be disappointing.

Such failure of the crops to fulfil their promises was attributed to many causes. I have no hesitation in stating that, in the majority of cases, the failure was attributable to frosts. The damage wrought by frosts throughout the year was of two kinds. The early-sown wheats which had made considerable growth throughout the winter and had not been fed off, were

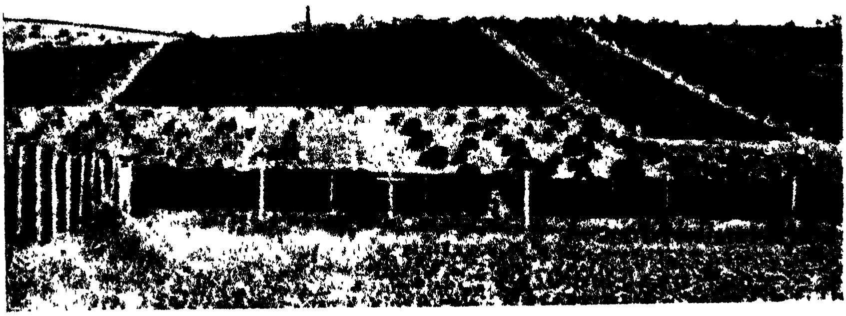


Fig. 1. Showing areas on lower levels which were cut for hay.

affected by the ordinary winter frosts. The effect of these upon such crops was to injure the stems, causing many to die back. Other stems were only partially affected, and produced heads upon which many of the spikelets had been killed. Other stems having perfect heads were weakened at the base, and, through the action of winds, were broken down and placed beyond the reach of harvesting machinery.

Only one early variety, Bunyip, was affected seriously in this way at the Bathurst Farm during the past season.

For further information *re* the effects of such frosts, see my article "Wheats and Frost" in the *Gazette* for August, 1906.

These early crops were also affected by unseasonable frosts in the spring, and perhaps during 1906 the damage caused by such was in excess of that

by the normal winter frosts. The frosts which damaged the bulk of the wheats at the Bathurst Farm during the past season were exceptionally unseasonable, and it is difficult to provide for such. Generally speaking the

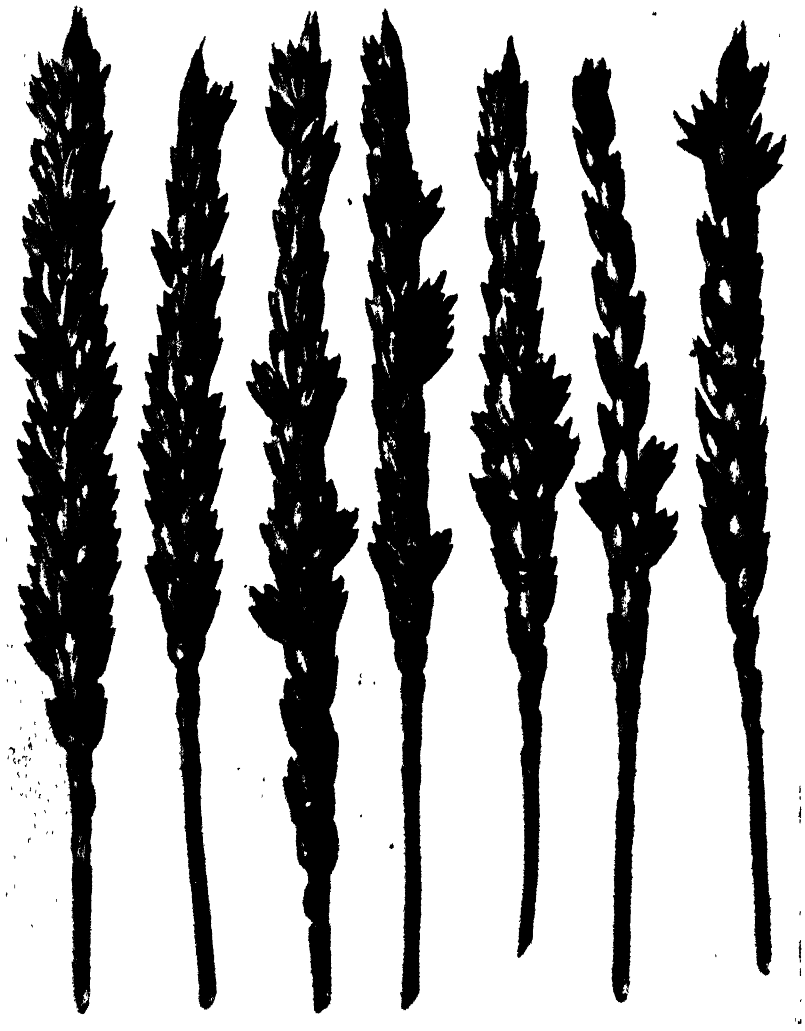


Fig. 2. Showing effect upon spikelets in different parts of ears.

NOTE.—The ear on the left is a full ear.

frosts are over in this district about the first week of October. A thermometer placed on a level with the ground in the wheat paddock registered 30 deg. Fahr. on November 6th, being 2 deg. of frost, and 32 deg. on the 11th November, it upon that date just reaching freezing-point. The result

of these temperatures was to destroy the pollen before fertilisation of all those wheats which were out in blossom at the time, and had not been previously fertilised. The injurious effects were most marked upon the lower-lying portions of the fields, the temperature there being the lowest.

A peculiarity of the frosting was that many spikelets of some of the heads were untouched, they either having been fertilised previously or had not reached the susceptible stage. All the spikelets in many heads failed to form grain, in others a few were left at the base, or at the tips, or in the middle of the ears. (See illustration, Fig. 2.)

The damage caused was imperceptible as regards the appearance of the heads for some time, the glumes or chaff not having been destroyed or whitened as in many cases of extreme frosting. When the grain began to fill out, the damage was apparent after careful inspection, and the chaff began to turn yellow prematurely. By a very careful inspection of the ears the damage was discerned in the early stages, thus allowing of such areas being cut for hay. In many cases such was not detected, and resulted in disappointing yields after being threshed or stripped.

As regards the first form of frosting, a better knowledge of varieties as regards their seasons will help to overcome such. Also the feeding-off of all winter-proud wheats is a most desirable practice. As regards the unseasonable frosts which occur fully a month later than usual, they are difficult to provide for.

Under normal Australian conditions the summers are dry, and the wheats to give the best results must be early, yet not too early. The late wheats are more often affected by drought than the early wheats are by frost.

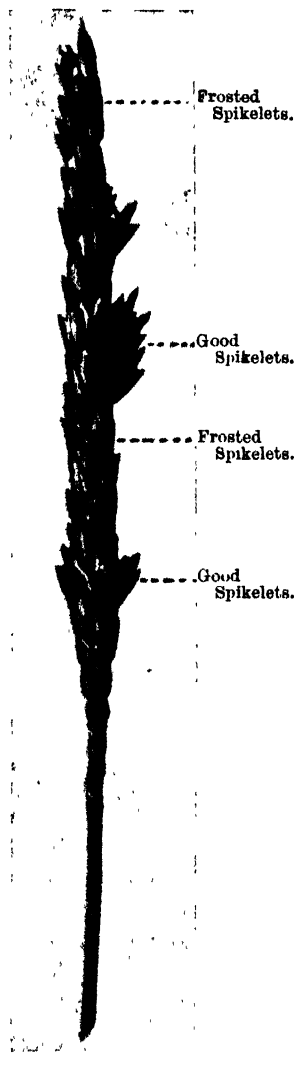


Fig. 3. Showing details of ear affected by frost.

Of the many wheats grown at the Bathurst Farm, very few excepting the very late ones escaped frosting in 1906. These very late wheats do not give satisfactory yields during ordinary seasons.

Concrete Dwellings and Farm Buildings.

F. G. CHOMLEY.

ONE of the most serious problems settlers and farmers have to face in the country is the erection of a dwelling and farmstead. In the timbered districts, now fast disappearing, the difficulty is not intense, timber can be obtained practically for the cost of cutting and hauling, and where this does not entail any very great expense, there is no need to look round for a more permanent building material. However, the districts where sufficient timber of a suitable kind for building can be obtained are in the minority, and the progress of agriculture, with the consequent destruction of the natural timber, reduces to a great extent the prospect of the future settler of being able to obtain a supply close to his holding. In some districts good clay for brickmaking abounds, and many places have been built of bricks that have been burnt almost on the site of the dwelling. This, however, is usually a very costly method, and the bricks which are made in this manner are generally either slop-moulded, or sand-stock moulded, and are neither as dense nor as hard and durable as the dry-press bricks now generally made, where the output warrants the erection of machinery.

Even when bricks of good quality can be obtained at a reasonable price, the building is not a very suitable one for this climate, for after a few days of hot dry wind the bricks become heated right through and keep the house almost as hot at night as in the day-time, and even after a change from a hot westerly wind the heated walls continue to slowly give off their store of warmth to torture the inmates. A wooden house, although it becomes very hot during the day has the advantage of cooling off as soon as the sun goes down, which in a measure compensates for its inability to do anything towards keeping the heat out during the day.

It is indeed fortunate that there is a material more lasting and cheaper than brick, and more easily obtained than timber, except in the heavily-timbered districts—a material that, from its nature, can be moulded into forms most suitable to construct walls of buildings. This material is concrete—a mixture of Portland cement with sand, stone, and water. Most of the material required can in many cases be obtained in the vicinity of the proposed building.

Although concrete was in use by the Romans, its use in building, particularly cottages and villas, is of quite recent origin. When the production of Portland cement came about at a cheap rate, produced by

the aid of powerful machinery, brick, dressed stone, and rubble no longer held the position of being the only suitable materials to use in erecting permanent buildings. Concrete made from broken stone, sand, and ordinary hydraulic lime has in the past been used for foundations, for backing-up retaining walls, and for forming large solid blocks for sea-walls and breakwaters; but modern concrete is made with the best quality of Portland cement, sand, and broken stone, the proportions varying with the nature of the work, the fineness or otherwise of the sand, and the size of the stone. The object is to produce a mixture that will consist, when set, of a solid mass, the cement forming a thin film over each grain of sand, thus filling the voids between the particles, while the sand and cement will cover the surface of the broken stone, and fill the voids therein. It is thus plain that the best kind of sand will be one in which the grains vary in size, and are present in about equal quantities; similarly, the stone may be a mixture of sizes, the largest not being of a greater diameter than will pass through a 2½-inch ring, while the other sizes should be in about equal proportions. In some places, notably the bed of rivers and creeks, gravelly deposits may be excavated that, in their natural state, consist of a suitable proportion of stone of various sizes mixed with sand, which may be made into concrete by the admixture of cement without the labour of screening the gravel.

It is claimed by some builders in America that the advent of the concrete hollow-block building system has done more for the advancement of the small householders' comfort than any other modern invention. The subject has even engrossed the attention of the master-inventive genius of to-day —Thomas Edison—and in an interview with J. H. Adams, published in the New York *World*, the following statement is made, in reply to Mr. Adams's question :—

"And what about the cement proposition? Is that a success?"

"Yes, indeed, it is a booming enterprise. We have a plant at Stewartsville, N.J., just below Easton, that will soon be turning out 10,000 barrels of the finest grade of Portland hydraulic cement daily. That is the coming material for construction; it supersedes stone, and is vastly cheaper to use than any other material.

"This cement mixed with gravel, sand, and water makes a concrete that when hard will defy dynamite. If the buildings of San Francisco had been of hydraulic concrete, nine-tenths of them would be standing to-day.

"I have in mind a complete portable mould for a house of moderate size and design, the plans to be drawn by some prominent architect. This mould could be set up, and within a day or two the concrete poured in and tamped down, and in a week or so the moulds could be removed. Thus a complete cast-stone house would be made, including casing, interior divisions, fireplaces, chimneys—everything but plastering, decorating, the windows, and furniture.

"These houses would be for workmen near large manufacturing plants; they would be warm in winter, cool in summer, far cheaper than the average house built to-day, and would last for a hundred years."

Making Concrete.

As was pointed out previously, the object to be aimed at is to form a solid mass, in which the cement fills the voids between the sand particles, and the sand and cement fill the voids in the gravel or broken stone, the stone being evenly disposed throughout the mass. The cement is purchased either in barrels or sacks; but the greatest care should be taken to protect it from damp during transit, and while being stored on the job. The cement should be of the best quality, and purchased from a reliable source, as it is the important portion of the material; the best sand, gravel, and workmanship cannot make permanent concrete from inferior or low-grade cement.

The sand should be clean and coarse, or an admixture in equal parts of coarse and fine sand; it should be free from clay or loam. To roughly judge the quality of the sand, it may be rubbed between the hands; if they are badly discoloured, do not use it. A better way is to fill one quarter of a clear glass bottle with sand, add clear water till three-quarters full, shake the bottle well, and if a layer of mud settles over the sand, discard it. If, on the other hand, the water remains clear, the sand may be regarded as fit for the purpose. The cement and sand mixed is called the matrix. The broken stone or gravel is called the aggregate, and should be of hard stone; soft sandstone should be studiously avoided. Sharp broken stone is often used, such as granite, ironstone, trachyte, &c.—but the most generally used aggregate is gravel, either screened to remove the small pebbles and sand, or, when the sand and stone exist in the proper proportions, it may be used as found. It should be ascertained, however, by means of the water test above alluded to, that there is no clay or loam among the gravel; if there is, this must be washed out, or gravel obtained elsewhere that is perfectly clean.

It is perfectly feasible to use cinders which have been well screened to remove the dust, but the resulting concrete will not be so strong as that made with rock or gravel; but it may be quite strong enough for the job in hand—say, for floors and filling in behind brickwork, or for concrete walls, in some cases. The water used should be clean and free from acid or stróng alkalis; but, generally, any water used for domestic purposes or stock is good for concrete.

In estimating the amount of concrete required, it must be borne in mind that the bulk of concrete is little more than the bulk of aggregate, because, as has already been pointed out, the sand and cement little more than fill the voids in the aggregate.

It has been proposed by Lieut. Sankey, R.E., in *Engineering*, that the following specification be made for concrete:—"The percentage of voids in the selected aggregate is to be found, and sand and cement are to be added to make sufficient mortar of the quality x sand to one cement to fill the voids + 20 per cent.—where x is the ratio of sand to cement."

The proportion of voids to the aggregate may be ascertained by filling a watertight box of known dimensions with the material, and measuring the

qauntity of water poured in, so as to fill up the interstices. The amount of voids in 1 cubic yard of aggregate is given in the following table:—

	1 cubic yard contains voids amounting to—
Stone broken to 2½ inch gauge	10 cubic feet.
Do 2 "	10⅔ "
Do 1½ "	11⅓ "
River ballast (which contains the necessary sand) ..	4½ "

The proportion of cement, sand, and aggregate varies with the class of work, and may be classed for convenience as follows:—

1. Strong concrete, for reinforced beams, superior foundations for machinery, &c.—

   1 : 2 : 4

   One part cement, two parts sand, and four parts broken stone or gravel.

2. A medium mixture, for machine foundations, thin walls, and reinforced work, &c.—

   1 : 2½ : 5

   One part cement, two and a half parts sand, and five parts broken stone or gravel.

3. General mixture, for dwellings, dairies, tanks, silos, &c.—

   1 : 2 : 6

   One part cement, two parts sand, and six parts broken stone or gravel.

In measuring the cement, it is taken as firm and packed as it arrives from the maker, and not loose as it is when turned into heaps.

Mixing.

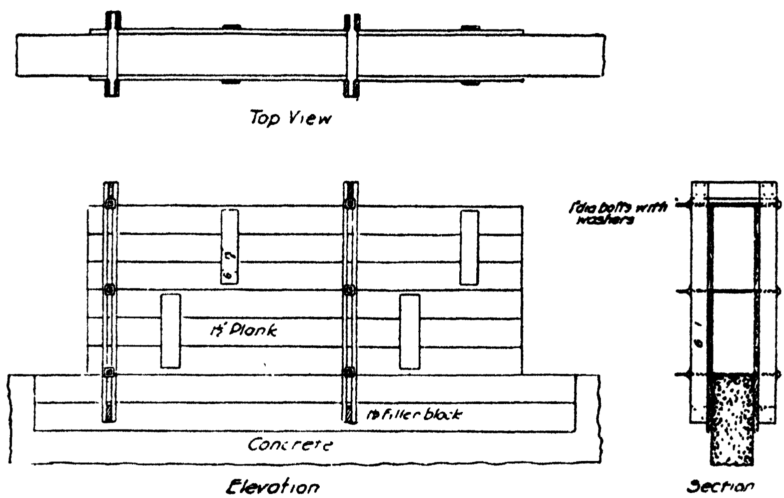
For the purpose of mixing and obtaining the proper proportions, an empty cement cask, with the heads knocked out, is most convenient. This is stood upright and filled with sand or gravel, as the case may be, and then pushed over, allowing the material to run out. For mixing the concrete, a flat surface covered with sheet-iron is the best to shovel the concrete backwards and forwards on.

It is most important that the mixing be thorough. It is in improperly mixed concrete that flaws and cracks are found. Where much concrete is to be mixed, it is usual in modern practice to use mechanical mixers. These machines are either batch mixers or continuous mixers; the former are to be preferred. There are many suitable machines on the market—they are, practically speaking, churns specially adapted for the work, and make a more perfect mixture than is generally made by hand, but not better than it is possible to make, if the work is properly supervised.

The cement is first mixed with the sand until it is thoroughly blended; the stone—first wetted—should then be thrown on top, and the whole shovelled back-and-forth at least three times, water being added from a water-can with a fine rose on the second turning; water should be added in sufficient quantity, and no more, to make a soft mixture that will not quite support a man. A little experience will soon show the degree of moistness to produce the best result.

Construction of Solid Walls.

In building solid concrete walls *in situ* it is necessary to have movable forms or moulds. These are made of pine boards about $1\frac{1}{4}$ inches to $1\frac{1}{2}$ inches thick, planed smooth on the inside—by reference to the illustration it will be seen how they are set up—the boards should be well braced by stout cross-pieces, to prevent them bulging in the middle (due to the



Form for Solid Concrete Wall

tamping down of the concrete). To maintain an even thickness of wall, the forms should have several cross-ties; these should be either iron rods that may be knocked out, or fencing-wire stretched from one side to the other, and twitched up with a piece of iron or wood. If iron rods are used, they should be well greased before the concrete is allowed to come in contact with them; if wires are used, they may be cut off flush and left in the wall. There should be no cracks in the forms, or the concrete will ooze through and leave ribs on the wall, making the removal of forms difficult.

The concrete is tamped in with a light rammer, or worked down with a blunt spade to relieve any confined air, the spade being worked on the flat against the forms; this works back any large stones, and brings the matrix to the face, making a smooth job. In ramming, do not use a flat-face rammer of large area, it does not work the matrix through the aggregate.

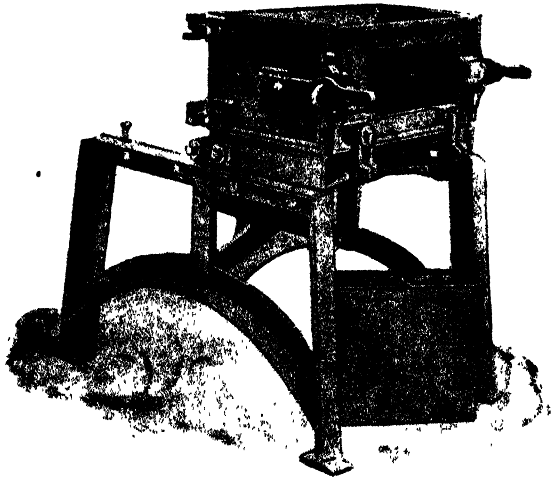
This kind of wall, which is suitable for foundations, water-tanks, manure pits, dairies partly below ground, and cellars, may be materially strengthened by embedding in the concrete, as the work proceeds, pieces of iron or steel wire, or light bar-iron—in fact, concrete reinforced with

steel rods becomes so strengthened, if the rods lie in the right direction to take the strain, that even girders are made in this manner for bridges.

The forms should not be removed until the concrete has set. This will vary according to the dampness of the concrete and the weather. If there is no pressure, the forms may be removed in about twenty-four hours; but in the case of a retaining wall the forms should be left in position for three or four weeks on the side furthest from the bank. The concrete wall should be damped frequently to prevent too rapid drying, and the top of the wall should be covered with bags. Before setting up the forms for a fresh tier, the upper surface of the wall should be chipped with a stone axe, to make a key between the two surfaces, and before the next layer of concrete is added the surface should be thoroughly swept to remove dust, and then well damped. To allow for contraction, where the wall is not reinforced, sheets of tarred paper may be put in to cut the wall into sections, and prevent cracks.

Hollow Walls: Why they are cool.

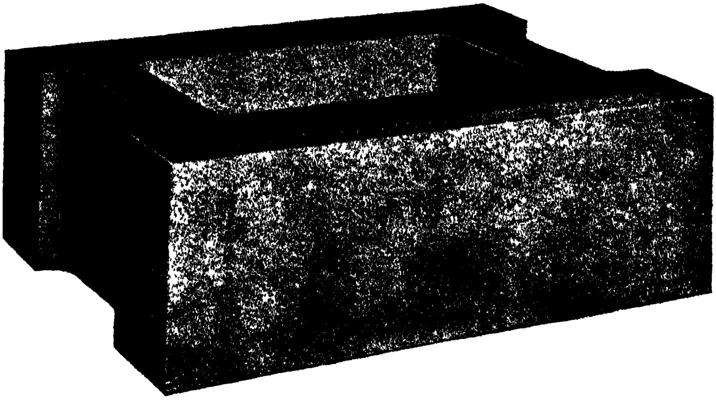
The non-conductivity of a material depends on the amount of still air it contains. The materials, such as fur, knitted goods, &c., used as clothes, are of a porous nature. If these are subjected to hydraulic pressure, it makes them mere compact sheets, which do not retain the heat



Small machine for moulding hollow concrete blocks.

of the body, or give any sense of warmth. From this it may be concluded that air is a bad conductor of heat. It is for this reason that a cellular wall is cooler than a solid one, and if the air spaces are dead—that is, sealed, so that the air cannot circulate—a good non-conducting wall is

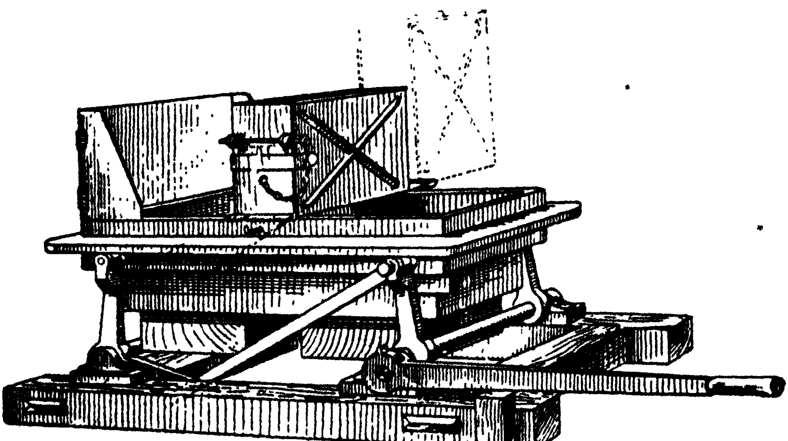
obtained. In a hot climate, such as extends over a large area of New South Wales, it is most desirable that a dwelling should be one that is cool in summer. A dwelling that resists the heat is also warm in winter.



A hollow concrete block, faced with a superior mixture of cement and sand.

Building Hollow Walls.

Hollow walls may be built in three ways—first, they may be formed in a continuous wall by means of a collapsing or tapering core, the cores and forms being raised as the work proceeds. This method has been largely used in America, and patents have been taken out for devices to simplify the construction of continuous hollow walls, both here and in America. These walls are sometimes reinforced by putting in wire running the

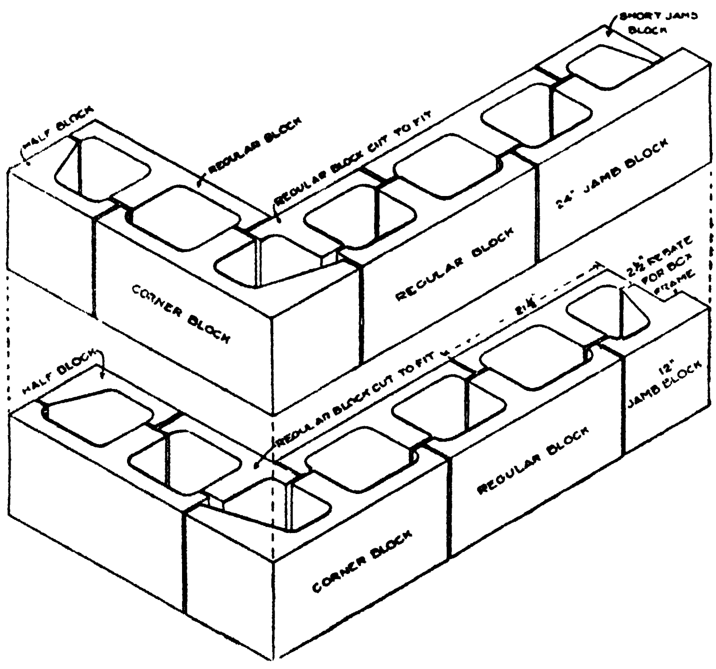


Machine for casting hollow-wall concrete blocks.

length of the wall, with tie pieces, running across the length through the web. By this means, with careful workmen, concrete of less thickness may be used.

A second system is to cast a number of hollow blocks, which, when set one on top of another like bricks, cause a pipe to be left the whole height of the wall. These blocks are cast in machines made for the purpose, and are patented, and generally turn out blocks having some particular feature such as rock-faced, tool-faced, or ornamental designs, according to the mould used. There are many designs, varying in mechanical details and price. An illustration of a small moulding machine is shown.

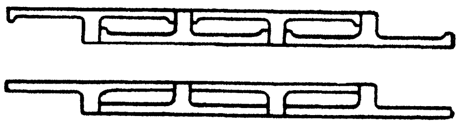
The third system, which has some of the advantages of the two former, with many special advantages peculiar to itself, is that in which the block is of such a design, that when placed in position to form a wall, hollows are left. The machine used to cast these blocks is shown in the illustration, while the shape of the blocks is very clearly shown in the various illustrations of walls for different purposes. A machine such as that shown in the cut is capable of turning out daily, with one man, 75 to 80 blocks 2 feet long by 1 foot high, or, with two men, 180 blocks. The width of the wall is dependent on the length the tail of the block is made, which can be regulated in the machine. Blocks of this description can be built up into hollow walls where the content of the air spaces is equal to that of the concrete. A wall of this description is far



Standard construction for walls.

cooler than a solid wall, and has the additional advantage of saving fully half the material. The saving of material is not made at the sacrifice of strength in the direction in which it is required. The filling of the

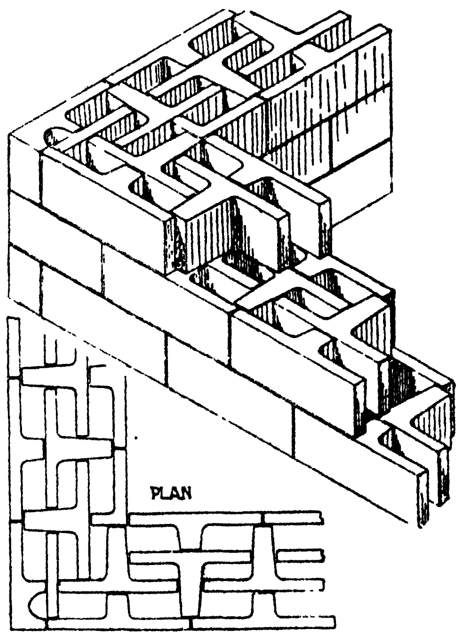
moulds with concrete is similar to the process of filling the forms for a solid wall. The blocks when cast, and the machine collapsed, are removed on bearing-off boards to dry and mature, which they do in about three to four weeks, during which time they should be frequently damped to prevent the outside drying before the middle.



PLAN OF 4½ IN. PARTITION WALL

The blocks, while green, should be handled carefully, and not allowed to be knocked or jarred.

Where additional coolness is required in a dairy, butter factory, or wine cellar, the blocks may be laid to have double or treble air spaces, the width of the wall being proportionately increased.



Hollow-wall suitable for wine-cellars, cold storage, cheese and butter stores, &c.

The making of hollow blocks, and blocks of such shape that they can be built up to form hollow walls, is now in such an advanced stage that machines have been patented, and are now manufactured to turn them out in the best manner. The modern builder has no need, therefore, to worry about how he is to make blocks; he only has to obtain a machine—

and they are for hire at a reasonable rate—and go straight ahead. These machines will turn out blocks for straight walls, corners, arches, jamb-blocks, fire-places, flues, round tanks and silos. A rough estimate is given of the cost of turning out hollow-wall concrete blocks by means of such a machine, where the following prices for materials are ruling:—

Gravel, metal, and sand, @ 6s. per yard.
Cement, @ 12s. per cask.
Concrete, one part cement, two parts sand, six parts broken stone or gravel.
Blocks, 24" x 12", with 9" tail (over all).
180 blocks for a 9-inch wall can be made each day by two men.
180 blocks is equal to 180 super. feet, or 20 super. yards of wall.

		£ s. d.
Labour to make 180 blocks—two men @ 8s.		0 16 0
Cement ,, ,, ...		1 7 0
Gravel, &c. ,, ,, ...		0 14 0
		2 17 0
Cost of laying 180 sup. feet, equal to 20 sup. yards, @ 1s. per yard...	1 0 0	
Cement mortar for 20 yards, @ 6d. per yard ..	0 10 0	
		1 10 0
		4 7 0
Total cost of 180 blocks, or 20 sup. yards in wall		4 7 0
Cost per yard of 9-inch wall, 4s. 4½d.—say		0 4 6

A 9-inch wall, taking bricks at 45s. per thousand, costs from 6s. 6d. to 7s. per super. yard laid in wall. The above estimate must be taken purely as a general one, as the cost of materials varies in every district—for instance, in many places sand and gravel are very easily obtained, carting a few chains being the only cost—while in other districts the price of bricks, owing to the distance they would have to be carted over bad roads, would make the cost per thousand run from 70s. to 90s. Hollow wall concrete has been proved, both here and in America, where it is so largely used, to be not only cheaper and cooler, but absolutely better than brick. The durability of concrete is undoubted. The Pantheon, a Roman temple, has a dome 142 feet in diameter, constructed entirely of concrete. This is perfectly sound and strong to-day, after nearly 1,900 years of service. One of the main features of concrete as a building material that should commend it to the attention of dwellers in the country far removed from the sea-board, and where rail freight charges are necessarily high, and, perhaps, a long stage by team also to be negotiated, is the fact that freight only has to be paid on the neat cement, and when it is further considered that 1 cubic foot of bricks weighs 90 lb., and one cubic foot of hollow concrete only weighs about 50 lb.—and of this, only one part in eight, or, roughly, about 6½ lb., has to have freight paid on it instead of 90 lb.—it will be seen what possibilities there are in this material for building in the country, where freight is high.

The non-inflammability of this material is another advantage, and a large annual charge for insurance is saved by its employment. By using

concrete wherever possible, a dwelling may be made practically fire-resistant. The roof and ceilings may be of cement sheeting or fibro-cement. Verandah posts and rails are now made of reinforced concrete, durable and white-ant proof. Doors have been made of reinforced concrete, patents for such having been taken out. These doors have been used in London in lieu of iron fire-proof doors.

There seems to be an idea prevalent in many people's minds, that there is some latent difficulty in making concrete. It is certain that some concrete is better than other; but the general consensus of opinion among those who have had most experience of working with concrete, and other means of building—wood, brick, galvanised iron, wattle and dab, and pisé—is that concrete, either built solid *in situ*, or with hollow blocks, presents no difficulties, and is as simple as it looks. With only ordinary care in keeping the cement dry up to the time it is used, obtaining clean, sharp sand and good gravel or broken stone, a creditable permanent structure can be built without any previous experience of masonry or bricklaying. This fact alone should commend it to the careful attention of those about to build.

There is absolutely nothing to prevent any person erecting a small dwelling, dairy, or anything of this nature from the information given; but where buildings of considerable magnitude, having large span roofs or long lengths of walls subject to strains, a competent architect conversant with reinforced concrete should be consulted, for in the proper designing of the building, and the correct placing of the reinforcing rods in their positions to take the strain, many economies may be made, while the resulting building will be far stronger than if twice the concrete and iron rods were used, and put in the wrong place.

[*We are indebted to several Catalogues for illustrations.*]

Bees and their Management.

ALBERT GALE.

WINTERING.

"COMING events cast their shadows before them." The cold we are experiencing is the shadow of an event of a season that is rapidly overtaking both small and great amongst our bee-men. To these men it is an event that is no respecter of persons—the learned and the simple in bee lore, the seasoned veteran and the newest of amateurs amongst bee-keepers must bow to the iron will of old Father Winter. And woe betide that bee-keeper who has been so avaricious as to take the last pound of flesh (I mean honey) from his bees. The past summer has been none too good for the bees. In too many districts the honey harvest was almost, if not quite, a failure. With the bees it was "living from hand to mouth." Those bee-keepers who, in some districts, extracted the spring and summer flow in the hope that the autumn would give sufficient surplus honey for the bees to pull through the coming winter will be disappointed.

In some districts the honey harvest has been exceptionally good, and reports tell of yields that may be regarded as quite phenomenal; but these are the exceptions.

There are two things that militate against the successful wintering of bees: dampness and poverty. These are the two great enemies that attack the slip-shod bee-keeper during winter; and, what is more, these two will present themselves to the bee-keepers in every district of this State—the great plains among the waybacks, the elevations along the Great Dividing Range, and the coastal districts. The rigidity of climate will not affect the first and last of these districts. The tablelands is where King Frost will make his presence most severely felt.

We have had so many dry seasons lately that the coming winter is more than likely to be a wet one; the time is fast hastening when there must be a turn. The autumnal rains that have already fallen may produce a wet winter. The spring and the summer of '06 and '07 may be the good time we have been looking forward to, that the weather prophets have foretold. If our bee-keepers have been wise, and increased the number of their colonies, that were so decimated by the late droughts, it is to be hoped that their success will not be wasted during the forthcoming winter. "Take time by the forelock." What have been dry sites for bees in the past seasons may not be so in the coming one. By dampness I do not mean merely the moisture that percolates through the hives, but the dampness of the situation of the apiary. Bees that are kept where the sun has not full play upon the hives during the winter months, and where these latter are constantly surrounded by a cold, damp atmosphere, will not come

out in the spring as healthy as those that are kept in the antithesis of such surroundings. For humanity, the sunlight and plenty are accounted as the most active agents for a healthy constitution. So it is with bees. Dampness and poverty are man's greatest enemies, and they are also the great enemies of bees. The reason why bees do so much better on the sides of hills, where there is plenty of drainage, is that after a rainfall the water gets away quickly, and dampness does not hang about the hives. Keep the surroundings of the hives as dry as possible, especially during winter. To do this, see that the air has full play under the bottom board, *i.e.*, if you have not as yet discarded these for cement, as was recommended by me, and illustrated in detail in the *Gazette* for May, 1905. If the bottom boards are old, or made of wood that is of an absorptive or spongy nature, replace them at once with something better. See that the drip from the eaves of the covers falls clear, and that the hives fit squarely and closely on the bottom, so that the rain that beats on the sides is not conducted within. Paint the hives with at least two coats of good, thick paint, colour according to taste. After having given the cover of the hive the first coating of paint, and before it is dry, cover the whole of the lid of the hive with thin calico, rub it well into the paint, and then paint the calico with another coating of paint. When dry this will be impervious to any rain or snow that may fall upon it. If you use a quilt, put the woolly side next to the top bars of the frames. The woolly side of the quilt being absorptive will take up a good deal of the dampness of the hive. Dampness within the hives is not caused by the dampness without. It is caused by condensation. The temperature within the hive being greater than that without is the cause of it. The globules of water chasing each other down the window panes in winter time is the effect of the same cause. Keep your hives dry without, and the moisture that accumulates within, caused by condensation, will do little or no harm.

Poverty, in conjunction with dampness, will carry off many valuable hives of bees that otherwise would become a valuable asset to their owner. So will poverty, without dampness, have the same effect. It will be difficult for bees, well protected against wet and cold, to pull through a winter without a good supply of food. No substitute for honey is equal to the thing itself. There is no need for it to be the best marketable honey. Nectar that is good enough for bees to gather, no matter how inferior it may be to our taste, is good enough for bees to winter upon. About 30 lb. will be quite sufficient to carry bees through our short winters. Keep the bees well in the centre of the hive by putting the combs of honey on either side of them.

Frosts, snow, and cold winds are most felt in our mountain districts and on the tablelands. "A good bellyfull is a good blanket for cold weather." Although the two former paragraphs have to do with every district within this State, this latter can have reference only to those localities aforesaid. One of the very best protections against cold is paper. If several layers of old newspapers are placed on the top bars, *i.e.*, between the frames and the cover of the hive, they will have a wonderful effect in economising the natural heat of the bees.

Farmers' Experiments—1906.

The Results of the Trials conducted in 1906 at Condobolin and Temora.

GEO. L. SUTTON,
Wheat Experimentalist.

The results, which are now given, of the trials conducted by farmers during the past season will prove of interest to their brother farmers throughout the State, and of special interest to the farmers of the districts in which the experiments were conducted.

As explained in a previous article on this subject, these experiments are not intended to duplicate the work of our Experimental Farms, but were planned with the object of enabling the experimenter to obtain information of direct benefit to himself, and which, either he himself must obtain in this way, or be content to do without it. The results of the past season's work show that, even in a district of apparently regular and similar climatic conditions, it is necessary for individual farmers to find out by trial what varieties suit their particular needs and conditions best. A feature of additional interest to farmers is that the operations of ploughing, planting, and harvesting, necessary for the carrying out of these experiments, were exactly the same as those adopted by the experimenter for raising the main crops of the farm. In each case the same implements were used. The supervision exercised by the Department consisted solely in seeing that the experiments were planned in such a way that the results obtained would furnish the information desired in a manner to be relied upon.

It is very pleasing to learn, from the letters accompanying the reports, that the experiments as planned entailed very little additional labour than that involved in planting and harvesting a main crop.

From the reports which are submitted, those interested can draw the conclusions to be derived from the results. In order to facilitate this being done, the results from the reports have been tabulated and arranged in a systematic manner.

Four experiments were planned, and planted, by fifteen farmers in three districts. In two cases no results are obtainable on account of failure, or partial failure, of the crops. Two experimenters have failed to furnish any report.

Experiment No. I—At Condobolin and Temora.

In this trial five varieties of wheat are grown under the same conditions, and compared with each other. In order that this trial should be as valuable as possible, one of the varieties under trial was the variety used by the experimenter for the main crop of the farm, and, therefore, considered by him as the most suitable for his district.

The reports received are as follow:—

CONDOBOLIN.

TRIAL of varieties of Wheat by Mr. J. F. Dawson, Esmoor, Condobolin. Seed was sown with wheat drill, and manured (each plot) with 40 lb. superphosphate per acre.

Plot.	Date sown.	Date harvested	Area.	Yield per plot.	Yield per acre.	Variety.	Remarks.
	1906.	1907.	acres.	bus. lb.	bus. lb.		
1	30 June	10 Jan.	·472	6 0	12 42	Ordinary main crop.	This was supposed to be fairly good seed.
2	30 "	10 "	·472	7 0	14 42	Federation	There was little sign of rust; crop was rather uneven.
3	30 "	10 "	·482	8 12	17 0	John Brown	Large grain.
4	30 "	10 "	·460	8 5	17 34	Bobs	Beautiful grain to harvest; no white-heads; stands in the field without bleaching from weather.
5	30 "	10 "	·460	6 7	13 20	Cretan (bearded).	Would have yielded a good deal more only harvester got choked. I lost a good deal.
6	30 "	10 "	·472	6 0	12 42	Ordinary main crop.	This grain was not so well filled as that from plots 2, 3, 4, 5.

TRIAL of varieties of Wheat by Mr. W. G. Innes, Condobolin.

Plot.	Date sown.	Date harvested	Area.	Yield of plot.	Yield per acre.	Variety.	Remarks.
	1906.	1907.		bus. lb.	bus. lb.		
1	19 May	5 Jan.	½ acre	2 53	5 46	Federation	In my opinion the best varieties seed sown was slightly weevily—crop was thin.
2	19 "	5 "	½ "	2 39	5 18	John Brown	Inclined to be flaggy. But for the extra rains probably would have been a failure.
3	19 "	5 "	½ "	3 17	6 34	Ordinary crop	Mixed, cannot name.
4	19 "	5 "	½ "	3 57	7 54	Cretan (bearded).	Stood dry weather better than any of the others. As a milling wheat, prefer any of the others.
5	19 "	5 "	½ "	2 51	5 42	Bobs	A good wheat and I think suitable for the district.

NOTES.—Early in the season there was enough moisture to bring the wheat above ground, then followed a dry spell, and at last good rains, when the growth was marvellous. Rust was seen in many of the crops, which is unusual here.

TRIAL of varieties of Wheat, by Mr. Thos. Johnston, Condobolin, in Myall Plain Country.

Plot.	Date sown.	Date harvested	Area.	Yield of plot.	Yield per acre.	Variety.	Remarks.
	1906.	1906.		bus. lb.	bus. lb.		
1	11 June	15 Dec.	½ acre	3 5	6 10	Cretan (bearded).	Average height, 2 feet; grain pinched; would not suit here
2	11 "	15 "	½ "	5 56	11 52	John Brown ...	Average height, 2 ft. 3 in.; good grain; does not seem to suit this part very very well.
3	11 "	15 "	½ "	9 32	19 4	Federation ...	Average height, 2 ft. 6 in.; large, plump grain; suits splendidly.
4	11 "	15 "	½ "	9 32	19 4	Bobs	Average height, 2 feet; plump, full grain; very heavy; suits well; equal to anything ever sown.
Main crop...	......		......	...	15 0	Purple Straw	Grain slightly pinched.

NOTE.—Trial wheats were broadcasted by hand and taken off with harvester.

TRIAL of varieties of Wheat by Mr. J. R. Scott, Mowabla, Condobolin. Rainfall during growing period 14·35 inches. The grain was sown with a wheat-drill as in field practice. A heavy frost in November affected the yield.

Plot.	Date sown.	Date cut.	Area.	Yield of plot.	Yield per acre.	Variety.	Remarks.
	1906.	1906.	yds.	lbs.	bus.		
1	8 May.	19 Dec.	132 x 14	242	10½	Rattling Jack..	
2	8 ,,	19 ,,	44 x 14	115	15	Cretan (bearded) Straw 2 ft. 9in.	A macaroni-bearded wheat. It is a good wheat to strip; rabbits however eat it in preference to any other of the wheats tried; a good wheat to grow in this district.
3	8 ,,	19 ,,	132 x 14	163	7½	John Brown Straw 2 ft. 6 in. high.	A good wheat to strip; did not yield up to appearances.
4	8 ,,	19 ,,	132 x 14	306	13½	Bobs Straw 3ft. high.	Yielded better than it appeared likely to; a very good wheat to strip and a good one to grow in the district.
5	8 ,,	19 ,,	,,	162	7	Federation Straw 2 ft. 6 in. high	
6	8 ,,	19 ,,	,,	275	12	Purple Straw Straw 4 ft. 3 in.	Sample was not nearly up to appearances; it looked as if it would go fully 6 bags per acre.

TRIAL of varieties of Wheat, by Mr. S. J. Waite, Bembella, Condobolin.

Plot.	Date sown.	Date harvested.	Area.	Yield of plot.	Yield per acre.	Variety.	Rainfall. Month.	Rainfall. Inches.	Remarks.
	1906.	1906.		bus. lb.	bus. lb.				
1	7 May	15 Dec.	½ acre	5 0	10 0	John Brown	May June	1·62 1·96	2 ft. 6 in. to 3 ft. 6 in. high, stooled well; would make nice hay.
2	7 ,,	15 ,,	½ ,,	5 12	10 24	Federation	July Aug.	·29 2·03	Has not bulk enough for hay; stools well.
3	7 ,,	15 ,,	½ ,,	4 45	9 32	Purple Straw (main crop)	Sept. Oct.	3·36 2·03	2½ to 3½ ft. high; makes good hay.
4	7 ,,	15 ,,	½ ,,	6 13	12 26	Cretan (bearded).	Nov. Dec.	1·86 ·80	4½ and 5½ ft. high; strong straw; heads suitable for threshing.
5	7 ,,	15 ,,	½ ,,	6 8	12 16	Bobs			3 feet high, even, well stooled; makes good hay.
					Total for growing period .		...	13 95	

SUMMARY of Results compiled from the Individual Reports.

Experimenter.	Computed yield per acre. Main Crop.	Federation.	John Brown.	Bobs.	Cretan.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Dawson, J. F.	12 42	14 42	17 0	17 34	13 20
Innes, W. G.	6 34	5 46	5 18	5 42	7 54
Johnston, Thos.	15 0	19 4	11 52	19 4	6 10
Scott, J. R.	12 0	7 0	7 0	13 20	15 0
Waite, S. J.	9 32	10 24	10 0	12 16	12 26
Average per acre ..	11 9	11 23	10 14	13 39	10 58

Arranged in relative order commencing with the variety having the best average yield, the varieties are as follow:—

			bus.	lb.	
Bobs, with an average yield of		...	13	39	per acre.
Federation ,,	,,	...	11	23	,,
Main Crop—varieties	,,	...	11	9	,,
Cretan	,,	...	10	58	,,
John Brown	,,	...	10	14	,,

TEMORA.

The following are the results of the Experiments carried out in the Temora District:—

TRIAL of varieties of Wheat by Mr. Breeze, Gidginbung, Temora.

Plot.	Date sown.	Date harvested.	Area.	Yield of plot.	Yield per acre.	Variety.	Remarks.
	1906.	1906.		bus. lb.	bus. lb.		
1	16 June.	22 Dec.	·45 acr.	7 14	16 4	Rattling Jack..	Badly put in; too wet; grew badly from the start.
2	16 „	22 „	·45 „	8 19	18 28	Federation ..	Same conditions as No. 1. Good plump grain, very short straw.
3	16 „	22 „	·45 „	10 8	22 30	Cretan... ..	Grew well from start, straw bends over, good sample grain.
4	16 „	22 „	·45 „	8 31	18 55	John Brown	Short straw 3 feet; good sample.
5	16 „	22 „	·45 „	6 13	13 48	Rymer	Short straw 2 ft. 6 in.; poor sample, bad grower, did not ripen well.

NOTE.—These plots were all sown under similar conditions on clay ground, and received 20 lb. superphosphate per plot, or 44½ lb. per acre.

TRIAL of varieties of Wheat by Mr. A. Bushell, of Lintondale, Temora.

No. of Plot.	Date sown.	Name.	Area.	Date headed out.	Date harvested.	Yield.	Yield per acre.	Remarks.
	1906.			1906. started	1906.	lb.	bus. lb.	
8	21 May	Rymer ..	⅜ acre	23 Oct.	21 Dec.	573	25 27	Very promising as a hay wheat; free from blight and rust. Good golden colour when ripe.
9	21 „	Dart's Imperial	⅜ „	1 Nov	21 „	463	20 34	Slight touch of rust.
10	21 „	Cretan (Macaroni)	½ „	4 „	21 „	482	16 3½	Free from blight or rust, but bad to harvest.
11	21 „	John Brown ..	½ „	26 Oct.	21 „	533	17 45	Take-all; seems worse in this plot. Free from rust.
12	21 „	Federation	½ „	started 12 Oct.	21 „	626	20 51	Very promising A little take-all but no rust.

TRIAL of varieties of Wheat, conducted by Mr. J. Donaldson, junior, Temora.

Plot.	Date sown.	Date harvested.	Area.	Yield of plot.	Yield per acre.	Variety.	Remarks.
	1906.	1906.		bus. lb.	bus. lb.		
7	24 May	29 Dec.	⅖ acre.	10 26	26 5	Dart's Imperial	Height, 3 ft. 6 in; a little take-all.
8	24 „	29 „	⅖ „	10 45	26 52	Federation	Height, 3 feet; very bad with take-all.
9	24 „	29 „	⅖ „	8 33	21 22	Cretan .	Height, 6 ft. to 7 ft. 6 in.; grew well from germination. About quarter badly lodged with wind.
10	24 „	29 „	⅖ „	8 13	20 32	John Brown . .	Height, 5 ft. 6 in.; germinated very badly some four weeks after sowing.
11	24 „	29 „	⅖ „	9 16	23 10	Dart's Imperial.	Height, 4 ft. 6 in.; germinated badly. Slightly affected with take-all.
12	24 „	29 „	⅖ „	8 9	20 22	Rymer	Height, 3 ft. 6 in.; did not ripen well; affected by hot weather.

All plots manured with 56 lb. superphosphate per acre.

TRIAL of varieties of Wheat by Mr. W. N. Keith, Sebastapol, Temora.

Plot.	Date sown.	Date harvested	Area.	Weight of plot yield.	Yield per acre.	Variety.	Remarks.
	1906.	1907.	acres.	bus. lb.	bus. lb.		
3	21 May	3 Jan.	·422	9 53	23 25	Federation ...	Will do well in this district.
4	21 „	8 „	·422	6 0	14 13	Cretan (bearded).	I cannot say I like this wheat.
5	21 „	8 „	·422	9 42	23 0	John Brown ...	I like this wheat quite as well as Federation.
6	21 „	8 „	·422	6 0	14 0	Dart's Imper'l. (own seed).	
7	21 „	8 „	·422	6 0	14 13	Rymer... ...	Do not care for it at all.

NOTE.—Land cropped for eight years; spelled last year and ploughed 4 in. deep for the crop.

TRIAL of varieties of Wheat, ½-acre plots, by Mr Nixon, Reefton, Temora.

Plot.	Date sown.	Date harvested	Area.	Yield of plot.	Yield per acre.	Variety.	Remarks.
	1906.	1906.		bus. lb.	bus. lb.		
10	2 May	8 Dec..	½ acre	8 0	16 0	Federation ...	Well filled, plump, shotty grain. Good strong straw. 3 ft. 10 in. high.
11	2 „	8 „	½ „	11 45	23 30	Cretan (bearded).	Large plump grain. The Sunshine Harvester cleaned it perfectly; beard no trouble. 5 ft. 6 in. high.
12	2 „	8 „	½ „	11 45	23 30	Dart's Imperial	Good plump grain; strong straw.
13	2 „	8 „	½ „	10 42	21 24	John Brown .	Fine large grain; strong straw. 4 ft. 4 in. high.
14	2 „	8 „	½ „	15 40	31 20	Rymer	Fine sample of grain; strong white straw. 4 ft. 5 in. high.
15	2 „	8 „	½ „	11 5	22 10	Dart's Imperial	Good plump grain; strong straw.

All plots received 45 lb. superphosphate per acre; seed at rate of 30 lb. per acre.

TRIAL of varieties of Wheat, by Mr. T. J. Reynolds, Temora. (Not manured.)

Plot.	Date sown.	Date harvested	Area.	Yield of plot.	Yield per acre.	Variety.	Remarks.
	1906.	1906.		bus. lb.	bus. lb		
3	17 May	18 Dec	½ acre	8 0	16 0	Dart's Imperial.	This wheat never stooled out like the other plots from the start.
4	17 „	18 „	½ „	15 2	30 4	Rymer .	Quite rust-free, straw, though fine, seems very strong; good grain.
5	17 „	18 „	½ „	13 21	26 42	Cretan (bearded).	Hardy, but rather weak in the straw; difficult to winnow, on account of beards.
6	17 „	18 „	½ „	12 16	24 32	Dart's Imperial.	Yields slightly better than John Brown.
7	17 „	18 „	½ „	11 56	23 52	John Brown	Grain slightly pinched.
8	17 „	18 „	½ „	12 20	24 40	Federation	Good hardy-growing wheat, which yields better than appearances would suggest

SUMMARY of Results compiled from the Individual Reports.

Experimenter.	Rymer	Cretan.	Main Crop variety.	John Brown.	Federation.
	Computed yield per acre.				
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Breeze, — ...	13 48	22 30	16 4	18 55	18 28
Bushell, A . .	25 27	16 3	20 30	17 45	20 51
Donaldson, J. . .	20 22	21 22	24 37	20 32	26 52
Keith, W. N. . .	14 13	14 13	14 13	23 0	23 25
Nixon, D.	31 20	23 30	22 50	21 24	16 0
Reynolds, T. J. . .	31 4	26 42	24 32	23 52	24 40
Averages ..	22 32	20 43	20 27	20 54	21 42

Arranged in relative order, commencing with the variety having the best average yield. The varieties are as follow :—

		bus.	lb.	
Rymer, with an average yield of	...	22	32	per acre.
Federation „ „	...	21	42	„
John Brown „ „	...	20	54	„
Cretan „ „	...	20	43	„
Main Crop varieties „	...	20	27	„

Experiment No. II.

In this trial five varieties of oats were grown under the same conditions and compared with each other. One of the varieties used in this trial was "Algerian," which was selected on account of its known suitability for our inland districts. It was desired to ascertain if the more recently introduced oats were as prolific as this well-known variety.

This experiment was carried out at Temora. The reports to hand are as follow:—

TRIAL of varieties of Oats, by Mr. Breeze, Gidginbung, Temora.

Plot.	Date sown.	Date harvested.	Area.	Yield of plot.	Yield per acre.	Variety.	Remarks.
	1906.	1906.	acres.	bus. lb.	bus. lb.		
6	16 June	22 Dec.	·45	13 13	29 24	Algerian ...	Very short in straw, sown too late; no smut.
7	16 „	22 „	·45	12 7	27 2	Big Four .	Badly smutted; strong straw, good grain; too wet for it; did not ripen well.
8	16 „	22 „	·45	11 30	26 4	White Ligomo	Strong straw, good grain, but smutty. Too wet; did not ripen well.
9	16 „	22 „	·45	13 8	29 13	Abundance ..	Smutty, strong straw; did not ripen well, too much rain.
10	16 „	22 „	·45	9 4	20 9	Silvermine .	Very smutty; strong straw.

NOTE.—The oats were sown at rate of 40 lb. per acre, and manured with superphosphate 44½ lb. per acre. Taken off with Harvester.

TRIAL of varieties of Oats, by Mr. J. Donaldson, junior, Temora.

Plot.	Date sown.	Date harvested	Area.	Yield of plot.	Yield per acre.	Variety.	Remarks.
	1906.	1906.		bus. lb	bus. lb.		
13	24 May	25 Dec.	1 acre	28 3	28 3	Big Four ...	Height, 4 ft. 6 in.; headed out November 22. Very smutty.
14	24 „	25 „	1 „	30 11	30 11	White Ligomo	Height, 5 feet; headed out November 22. Very smutty.
15	24 „	25 „	1 „	42 13	42 13	Algerian ..	Height, 3 ft. 6 in.; headed out November 9.
16	24 „	25 „	1 „	27 32	27 32	Abundance .	Height, 4 feet. Very smutty.
17	24 „	25 „	1 „	28 0	28 0	Silvermine ...	Height, 4 ft. 6 in. Smutty.

TRIAL of varieties of Oats, by Mr. W. N. Keith, Sebastapol, Temora.

Plot.	Date sown.	Date harvested	Area.	Yield of plot.	Yield per acre.	Variety.	Remarks.
	1906.	1906.	acres.	bus.	bus.		
8	21 May	...	·501	...	...	Big Four ...	Not harvested.
				about			
9	21 „	17 Dec.	·501	17	33⅞	White Ligomo	Very nice oats.
10	21 „	17 „	·501	17	33⅞	Abundance ...	Very good oats.
11	21 „	17 „	·501	21	41⅞	Algerian ...	By far the best for this part.
12	21 „	17 „	·501	17	33⅞	Silvermine ..	

NOTE.—Land cropped for eight years; spelled last year and ploughed 4 in. deep for crop.

TRIAL of varieties of Oats, by Mr. Nixon, Reefton, near Temora.

Plot.	Date sown.	Date harvested.	Area.	Yield of plot.	Yield per acre.	Variety.	Remarks.
	1906.	1906.		bus. lb.	bus. lb.		
1	2 May	10 Dec.	½ acre	10 27	21 14	Silvermine ...	4 ft. 6 in. high; thick strong straw; yield somewhat affected by proximity to green timber.
2	2 „	10 „	½ „	11 5	22 10	Big Four .	4 ft. 11 in. high; thick strong straw; good plump grain.
3	2 „	10 „	½ „	20 35	41 30	White Ligomo	4 ft. 11 in. high. A fine plump grain; a bit down in the straw.
4	2 „	10 „	½ „	19 38	39 36	Abundance ...	5 feet high. A fine plump grain. Best sample of grain. Thick strong straw.
6	2 „	8 „	½ „	19 15	38 30	Algerian ...	4 ft. 5 in. high. Good sample of grain; fine straw, not coarse.

TRIAL of varieties of Oats, by Mr. T. F. Reynolds, Temora.

Plot.	Date sown.	Date harvested.	Area.	Yield of plot.	Yield per acre.	Variety.	Remarks.
	1906.	1906.		bus. lb.	bus. lb.		
8	17 May	10 Dec.	½ acre	26 16	52 32	Big Four	Grain of good quality.
9	17 „	10 „	½ „	30 34	61 28	White Ligomo	Really a good feed oat, and worth further trial.
10	17 „	10 „	½ „	34 12	68 24	Algerian .	Although best yielder, the quality of grain for feed is not up to the other varieties.
11	17 „	10 „	½ „	29 25	59 10	Abundance ..	A good oat.
12	17 „	10 „	½ „	26 16	52 32	Silvermine ..	A poor sample of grain.

Manured with 46 lb. of superphosphate per acre.

SUMMARY of Results compiled from the Individual Reports.

Experimenter.	Computed yield per acre.				
	Big Four.	White Ligomo.	Algerian.	Abundance.	Silvermine.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Breeze, — ...	27 2	26 4	29 24	29 13	20 9
Bushell, A. .	24 20	27 30	40 10	...	...
Donaldson, Jno.	28 3	30 11	42 13	27 32	28 0
Keith, W. N. ...	......	33 30	33 30	41 30	33 30
Nixon, D. ...	22 10	41 30	38 30	39 36	21 14
Reynolds, T. J. ...	52 32	61 28	68 24	59 10	52 32
Averages...	30 37	36 35	42 8	39 8	31 9

Arranged in relative order, commencing with the variety having the best average yield. The varieties are as follow:—

	bus.	lb.	
Algerian, with an average yield of...	42	8	per acre.
Abundance „ „ ...	39	8	„
White Ligomo „ „ ...	36	35	„
Silvermine „ „ ...	31	9	„
Big Four „ „ ...	30	37	„

Experiment No. III.—A Demonstration with Simple and with Concentrated Superphosphate.

Some farmers in the Temora district were desirous last season of using concentrated superphosphate, but were afraid to do so, as they had been given to understand that by doing so they ran a considerable risk of injuring, if not destroying, their seed grain. As the best method of counteracting this inference, and of showing that concentrated superphosphate has no injurious effect upon the grain with which it was sown, this demonstration was planned. The reports and results are unmistakably conclusive that the effect of concentrated superphosphate, when distributed with the seed, is no more injurious than that of simple superphosphate used in the same way. As the most graphic way of showing this, the results from the respective plots and the averages of the results from the whole of the plots manured with each of the superphosphates are given. *It must, however, be distinctly understood that this trial was not conducted to determine the respective merits of superphosphate and concentrated superphosphate as economical sources of plant food.*

The concentrated superphosphate used in each case was the same, and one with a guaranteed analysis of 44 per cent. water soluble phosphoric acid. No particular brand of simple superphosphate was adhered to; the quantity required in each case was obtained from the stock which the farmer had purchased for use that season on the farm.

The actual amounts of simple superphosphate distributed in each case varied slightly, according to the capacity of the drills used. The amount of concentrated superphosphate distributed was governed by the amount (ascertained by trial) of simple superphosphate which the various drills would distribute. In each case it was such (as near as the gears of the drills would allow) that the same amount of soluble plant food (phosphoric acid) was applied to each plot.

As the non-injurious action of the concentrated superphosphate had been questioned, the precaution was taken to distribute slightly more than the equivalent of the simple superphosphate rather than a slightly less. The increased average yield of the crops, on the plots fertilised with concentrated superphosphate, is probably due to this.

The reports to hand are as follow :—

MANURE experiment with Wheat, carried out by Mr. A. Bushell, Lintondale, Temora. Sown with Dart's Imperial Wheat at rate of 40 lb. per acre, on 16th May, 1906.

No. of Plot.	Date sown.	Manure used.	Area.	Date headed out.	Date harvested.	Yield.	Yield per acre.	Remarks.
	1906.			1906.	1906.	bus. lb.	bus.	
1	16 May	Simple Superphosphates, 56 lb. per acre	¼ acre	1 Nov.	21 Dec.	4 40	18⅔	Half of crop was thin; slight touch of rust.
2	16 ,,	Concentrated Superphosphate, 20 lb. per acre.	¼ ,,	1 ,,	21 ,,	5 57	23¾	Seed not injured by the manure; slight touch of rust.

TRIAL of various manures with Dart's Imperial Wheat, sown at the rate of 35 lb. per acre, by Mr. J. Donaldson, junior, Temora.

Plot.	Date sown.	Manure used.	Area.	Date harvested.	Yield of plot.	Yield per acre.	Remarks.
	1906.			1906.	bus. lb.	bus. lb.	
1	24 May	Concentrated Superphosphate, 17 lb. per acre.	2-5th acre.	29 Dec.	10 43	26 47	Height, 3 ft. 6 in.; slightly affected by frost. A little take-all throughout.
2	24 „ ...	Simple Superphosphate, 54 lb. per acre.		29 „ ...	10 41	26 42	Height, 3 ft. 6 in.; slightly affected by frost. A little take-all throughout.

TRIAL of Concentrated *versus* Simple Superphosphate in manuring Wheat, by Mr. Nixon, Reefton, near Temora, sown with Dart's Imperial.

Plot.	Date sown.	Manure used.	Area.	Date harvested.	Yield of plot.	Yield per acre.	Remarks.
	1906.			1906.	bus. lb.	bus. lb.	
7	2 May	Simple Superphosphate, 42 lb. per acre	½ acre	18 Dec.	11 53	23 46	Good plump grain.
8	2 „	Concentrated Superphosphate, 20 lb. per acre	½ „	18 „	10 50	21 40	Good plump grain.

TRIAL of Concentrated *versus* Simple Superphosphate in Wheat-growing, by Mr. T. J. Reynolds, Temora, sown with Dart's Imperial.

Plot.	Date sown.	Manure used.	Area.	Date harvested.	Yield of plot.	Yield per acre.	Remarks
	1906.			1906.	bus. lb.	bus. lb.	
1	17 May	Concentrated Superphosphate, 17 lb. per acre	½ acre	15 Dec.	10 28	20 56	This plot ripened at least three or four days before plot 2
2	17 „	Simple Superphosphate, 54 lb. per acre	½ „	15 „	9 2	18 4	There was a patch of take-all which was very bad in centre of plot, reducing the yield. Sample of grain not equal to that from plot 1.

SUMMARY of Results compiled from the Individual Reports.

Experimenter	Computed yield per acre.	
	Simple Superphosphate.	Concentrated Superphosphate
	bus. lb.	bus. lb.
Bushell, A. ...	18 40	23 45
Donaldson, J., junior ...	26 42	26 47
Nixon, D. ...	23 46	21 40
Reynolds, T. J. ...	18 4	20 56
Average per acre ...	21 48	23 17

Experiment No. IV.

Carried out by Mr. J. Donaldson, junior, Sproule's Lagoon, Temora.

This experiment was designed to determine the needs of the soil, and to ascertain the most suitable fertiliser to apply to the wheat crop, when grown according to the system of cropping adopted on the experimenter's farm.

It seems from the results obtained as if the wheat plant requires a stimulant to enable it to exploit the soil to the best advantage.

Mr. Donaldson furnishes the following report:—

VARIETY used, Dart's Imperial, 35 lb. per acre. Seed planted 18th May, 1906. Crop harvested 29th December, 1906.

Plot No.	Fertiliser per acre.	Area.	Yield of plot.	Computed yield per acre.	Remarks.
			bus. lb.	bus. lb.	
1	No fertiliser	2-5th acre.	6 52	17 10	
2	Superphosphate, 54 lb.		10 41	26 42	Height, 3 ft. 6 in. Slightly affected by frost. A little take-all all through.
3	Sulph. Ammonia, 40 lb. Superphosphate, 60 lb. Sulph. Potash, 20 lb.		11 24	28 30	Height, 4 feet. No take-all.
4	Superphosphate, 60 lb. Sulph. Potash, 20 lb.		10 56	27 20	Height, 4 ft. 6 in. A little take-all.
5	Sulph. Ammonia, 40 lb. Sulph. Potash, 20 lb		11 14	28 5	Height, 4 ft. 6 in.
6	Superphosphate, 60 lb. Sulph. Ammonia, 40 lb.		11 3	27 37	Height, 5 feet. No take-all. Grew well from germination.
13	No fertiliser		6 46	16 55	

In 1904 the paddock was cropped with rape, which was fed off by stock; with the rape, 56 lb. of superphosphate per acre were applied. In 1905 wheat was sown, with 60 lb. of superphosphate; after the wheat had made a fair growth sheep weie put in it, and kept on it until August, when the paddock was bare.

The foregoing experiments represent intelligent efforts on the part of farmers to understand and make advances in their business. More similar experiments are required throughout the State. Experiments like No. IV, to be of real value, require to have the plots permanently defined, and to be carried out for a series of years. On this account, they are experiments which agricultural societies, having the welfare and advancement of their districts at heart, would do well to organise and foster.

Historic Fruit-trees at "Brucedale," Bathurst.

W. J. ALLEN.

HIDDEN away among the hills, about 9 miles distant by road from Bathurst, is the homestead of Mr. Herbert C. Suttor, situated on one of the many beautiful building sites on "Brucedale," where some of the best Merino

Stone Pippin Apple-tree planted 1824.

sheep of New South Wales have been bred for the last century, and where at present some of the finest sheep in the country may be seen, as also something which to my mind is of even more interest, and that is some very fine

old apple, pear, mulberry and other trees, some of which were planted in the orchard, on the flat, just below the homestead, by Mr. Suttor's grandfather in the year 1824. These trees were grown by a nurseryman at Baulkham Hills, and taken from the latter place to Bathurst in the year 1822. They were first planted on the banks of the Macquarie River, where they remained for two years, when they were removed to the site where they are still standing on the bank of the creek which runs through the station and looking the picture of health.

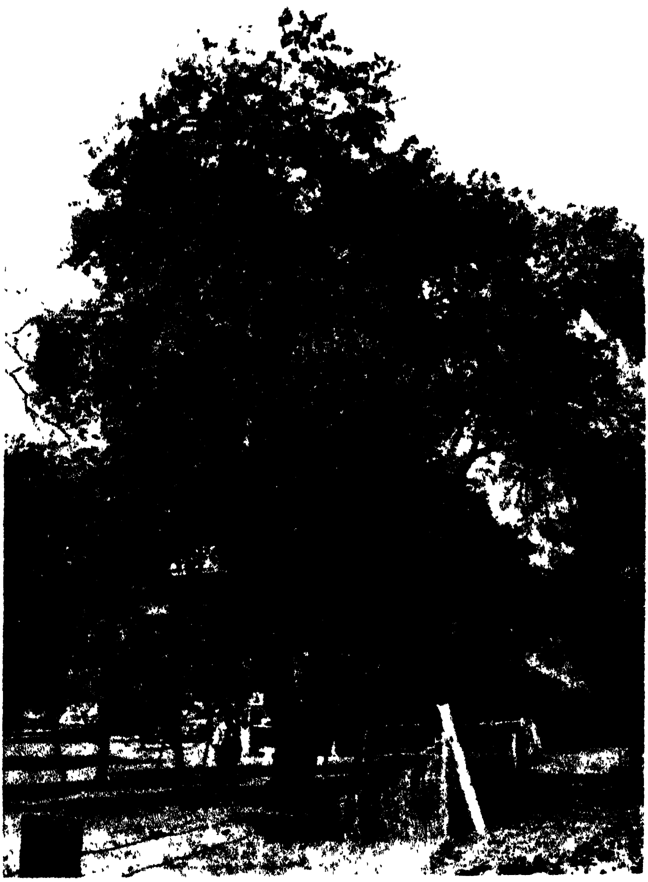
In the same orchard are some apple-trees which were planted in the year 1884, and which are carrying heavy crops of fruit, among them being the

Apple—Cox's Orange Pippin.

following varieties, viz. :—Stone Pippin, Cox's Orange, Northern Spy, Gloria Mundi, Ribston Pippin, and several other varieties, many of the trees carrying from 15 to 25 bushels of fruit of the very best quality, while some of the older trees are carrying upwards of fifty cases of high grade marketable fruit—in fact, I have not seen in any other part of the State such old trees as are to be seen growing in this orchard or such crops of fruit as are being borne by these old trees. They were started high up, as was the custom in former days, very few of the trees branching out lower than from 4 to 5 feet from the ground. It is some years now since that portion of the orchard has received much cultivation, but with the aid of a little

water, which Mr. Suttor pumps from a well, he has been able to grow vegetables, grapes, apples, pears, mulberries, &c., with but little if any trouble.

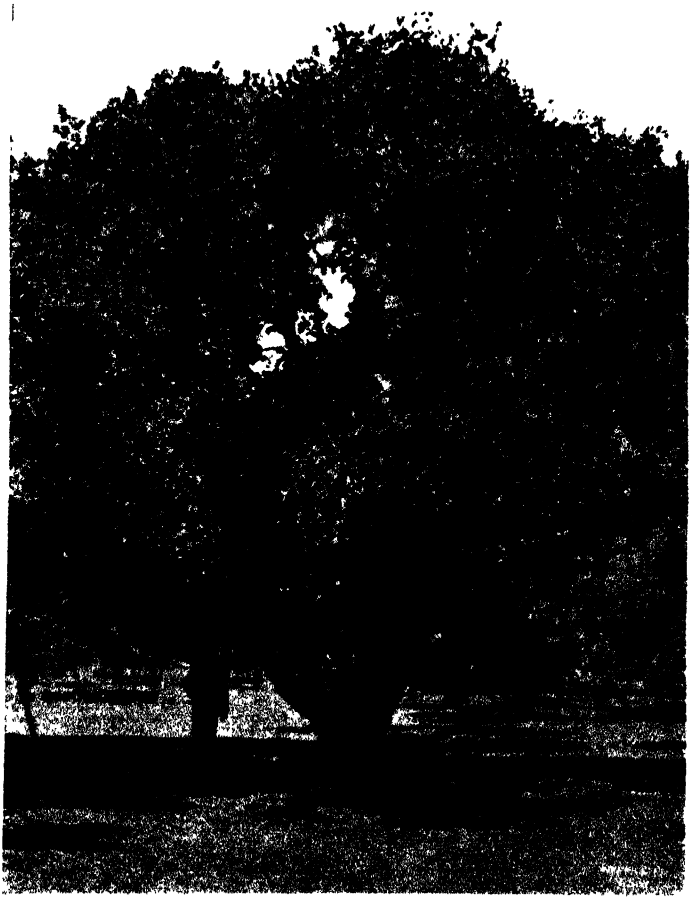
In order that the orchard may be irrigated with water taken from the creek, Mr. Suttor has made a small channel, about $1\frac{1}{2}$ mile long, through



Pear-tree, planted 1824.

which the water gravitates, and he is arranging to irrigate the garden and orchard with this supply, and thus save the trouble and expense of pumping water from the well. He has lately had installed a ram which draws its supply of water from the channel, and which raises up the water about 100 feet into tanks, which give an adequate supply of water for the house, flower-garden, and stables.

Coming back to the very old trees again, it is interesting to see trees which are doing so well, and carrying such heavy crops of fruit as these. It speaks well for this district for fruit-growing, and for the apples on the trees, which were hard and in first-class condition for exporting. Even the Ribston Pippins felt firm enough to carry around the world at the time of my inspection.



Mulberry-tree, planted 1824.

Mr. Suttor has hundreds of acres of land equally as good as that planted, but as sheep-raising there has proved so profitable with him, I do not expect to see him give up an industry at which he has spent a life-time to take up a new one, however profitable it may be, and, after all, Australian wool is known far and wide all over the world, and it is only by having breeders such as Mr. Suttor and others, who thoroughly understand their business,

that they have been able to make and maintain for our wool and sheep the very high reputation which it enjoys. I trust also that the time is not far distant when we will be exporters of apples to the old country and any other markets where fruit is admitted, as we can grow it in many parts of the State; and it is well for those with young orchards to know that trees on good deep soil will live to a good age in such climates, and carry good crops of fruit if they are given only the ordinary attention.

There are several fine old English mulberry trees, which were planted in 1824, which must have produced this year half a ton of fruit to each tree.

Butt of Mulberry-tree planted 1824.

The one shown in the illustration is 50 feet high and 52 feet wide, and is 11 feet in circumference 3 feet from the ground.

The pear-tree shown is 75 feet high, and the trunk is just 8 feet in circumference.

The stud sheep are allowed to roam among some of the old trees, and they have done good work, inasmuch as they have gathered up all windfalls, and in this way have kept the codling moth under. There could not have been more than 1 or 2 per cent. of the crop damaged by this pest.

If any of the trees remain still unpicked, they are well worth an inspection; and, although Mr. Suttor is a busy man, I feel sure he would be only too pleased to show any visitor his orchard, in which he takes a keen interest.

Pump and Well.

His name often figures among the prize-winners at the Bathurst Agricultural, Horticultural and Pastoral Society's Show, of which society, by the way, he is the President.

On the hardiness of the Richmond River or Hoop Pine.

Araucaria Cunninghamii, Aiton.

W. S. CAMPBELL.

THIS valuable soft-wood tree, like our other valuable soft-wood, the red-cedar, is becoming less and less, and stands every chance of becoming exterminated to make way for settlement, unless some means can be taken to preserve it in its native habitats, about the northern coastal districts of New South Wales and the eastern coast of Queensland.

Richmond River or Hoop Pine.

In New South Wales it is found in the country between the Tweed River on the north and Algomera Creek, a tributary of the Nambucca River, on the south, and, strange to say, so far as I can discover, no specimens have been found to the south of that creek, although under cultivation the tree grows well hundreds of miles to the south and far to the west.

This pine is valuable for its timber, and may prove useful for butter-boxes ; if so, its destruction will proceed even more rapidly than at present.

For many years past I have noticed the varied conditions under which this tree thrives. I have observed it growing in swampy alluvial soil and thriving well there; again on higher land, and away from the coast on black basaltic hilly and mountainous country, sometimes extremely dry.

Under cultivation it seems to grow very well almost anywhere, and it is a well known and largely grown tree for ornamental purposes and has been since its discovery. Taking advantage of a visit of our artist to my garden, for the purpose of illustrating some tomato plants, I had a photograph taken to illustrate this article.

The illustration shows two specimens of the pine referred to, growing in a 5-inch flower-pot. These pines, which must be nearly thirty years old, were sent to me, with a number of others crammed together in a soap-box, upwards of twenty-five years ago. They remained in the box with a few of the others for a considerable period, and then I potted them in the flower-pot in which they are now growing and in which they have lived for more than twenty years. Their present size may be judged from the budding-knife and trowel shown in the picture.

These two plants have been subjected to the roughest of treatment, and had not the pot been made of good material --English make--it would have been smashed years ago either by being knocked about or by the growth of roots. I may remark here that the flower-pots now obtainable here are of the flimsiest description, some of them being almost unfit for any use.

Sometimes water was supplied the plants, but frequently they suffered for want of it for days and days, and finding how surprisingly well they lived all through great neglect, I made a point of experimenting with them and have done so for years past. The pot contains now a perfect hard ball of roots, none of the roots having been allowed to extend beyond the pot. When water is applied it remains on the top of the roots for perhaps a day, or even two, before it is absorbed, a good deal of it probably evaporating. Very rarely a little liquid manure is given, and when it is, the foliage shows satisfactory signs of its use almost immediately.

From all this, and the many observations I have made amongst the pines in various places where they are growing naturally, I think I am safe in concluding that the *Araucaria Cunninghamii* is a remarkably hardy species of conifer—perhaps not so drought-resisting as our Western *Frenela*—but more hardy in other particulars.

Experiments with Nitrogen-fixing Bacteria in connection with Lucerne.

D. McALPINE.

It is now well known that the nodules or tubercles on the roots of leguminous plants, such as peas and beans, clovers and vetches, lucerne and wattle are due to bacteria, which have the useful property of utilising the nitrogen of the air and fixing it in the plant, so that the soil is thereby ultimately enriched. Not all bacteria are useful to the grower, for some are the undoubted cause of disease in plants, and from their nature and mode of multiplication, they are difficult to deal with. The bacteria are plants themselves, consisting of a single cell, and they are allied to the fungi since they do not usually possess the leaf-green or chlorophyll which enables ordinary plants to manufacture organic matter or carbonohydrate substances from carbonic acid and water in the presence of sunlight.

As agents of disease in plants and animals, including man, we are not here concerned with them, but in the form of nodule bacteria which are capable of using the free nitrogen of the air and converting it into nitrates for the benefit of the plant. It can thus be easily understood why leguminous plants are so valuable in a rotation of crops, since they accumulate nitrates in the soil instead of removing them, as wheat, maize, and other plants do, the one kind of plant being a nitrogen-storer, while the other is a nitrogen-consumer. And it is also evident why attempts should have been made to grow these bacteria independent of their foster-plants, so that in poor soils where the nodule bacteria were deficient or absent, they might be sown artificially and enter into a profitable partnership. Nitrogen-fixing bacteria in pure cultures are now being distributed by the United States Department of Agriculture, and an article by Dr. Geo. T. Moore on "Bacteria and the Nitrogen Problem" gives full instructions as to the use of these cultures.

Experimental Work.

As a result of the wide publicity given to this discovery and the desire to increase the yield of leguminous crops by such simple means, experiments were conducted in almost every country in the world to test the value of the new cultures in a practical way. Australia was not behindhand in this matter, and the results of experiments in different States show that there is general agreement as to the fact that there has been no material benefit to the growing crop from the use of such prepared cultures, either by means of soil or seed inoculation.

In New South Wales experiments were conducted with field peas in which the soil was inoculated, and with tares in which the seed was treated, as

recorded in the *Agricultural Gazette* for February, 1906. Mr. Guthrie prepared the solution from the American cultures for the inoculation of the soil for peas, treated and untreated plots were sown of each, and as regards the peas, the result showed that "there was nothing in the appearance of either plot that suggested any special treatment, and as far as the eye could detect, there did not appear to be any difference in the vigour of the plants." With the tares it is stated that "no perceptible difference was noticeable in the vigour of the plants in this experiment," but when a measured quantity of the crop was cut and weighed, there was a slight difference in favour of the treated plot. In South Australia peas and red clover were experimented with, and both seed and soil treatment were tried. The results as given in the *Journal of Agriculture* for June, 1906, were variable, and Professor Angus sums up as follows:—"The results so far in South Australia may be characterised as unsatisfactory, and in no way decisive. Although the seed inoculation seems to have been of some benefit to the crops, especially on the poor soil of Gumeracha, yet the disturbing factors were so great that little reliance can be placed on the results obtained."

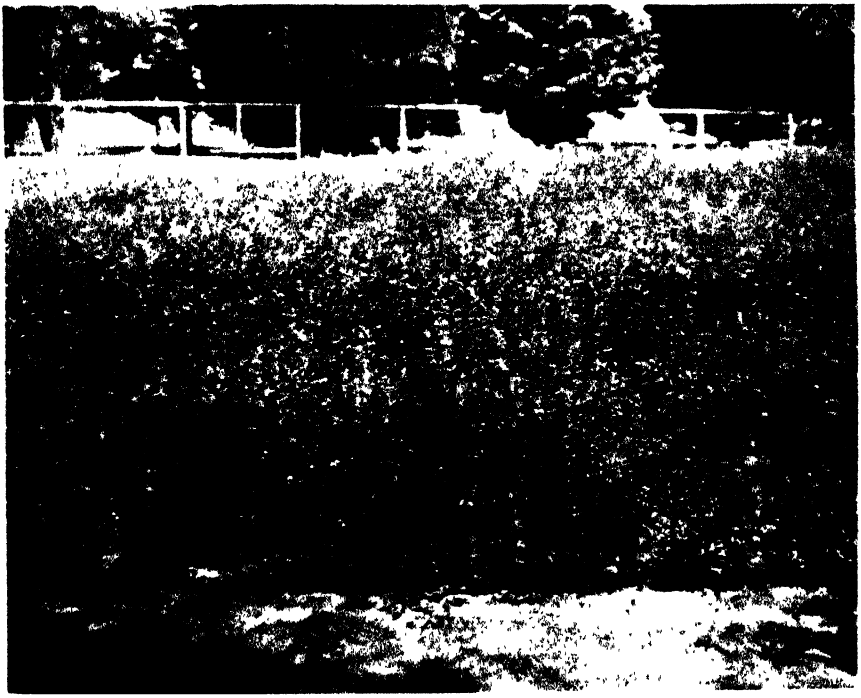
Even in Britain, where a variety of experiments were carried out under agricultural conditions, the results were not definite enough to warrant the general adoption of the treatment. In the *Journal of the Board of Agriculture* the necessity for caution is emphasised in the following terms:—"It is quite evident that the subject of plant inoculation in this country has not yet passed the experimental stage, and more work is required before one can feel at all justified in recommending either method for adoption on a field scale."

Experiments in Victoria.

Having been instructed to test the effect of adding nitrogen-fixing bacteria to lucerne seed under the ordinary conditions of growth, I obtained a package of the American culture in November through Messrs. Dalgety & Co., and at the same time Dr. Bull, of the Bacteriological Laboratory, prepared some local cultures from the roots of lucerne, obtained from the Bacchus Marsh district. In order that the experiment for treating the seed might be conducted under the most favourable and most satisfactory conditions, Dr. Bull attended to the preparation of the solution, and steeped the seed when the bacteria were active.

A convenient piece of ground was placed at the disposal of the Department in a paddock which had been fourteen years under grass, and the soil consisted of a sandy loam. It was ploughed and harrowed, rolled and cross-harrowed, and after manuring with superphosphate the seed was drilled in. There was a good rain after sowing, so that the seed got a good start. Owing to the lateness of the season in receiving the American cultures, I was under the necessity of sowing late, and the plots were not put in until 2nd December. About one-fifth of an acre was used, divided into three equal portions. In plot 1 the seed was treated with the Victorian culture, grown by Dr. Bull. In plot 2 the seed was untreated and used as a check, and in plot 3 the

American culture was used. Sown at such a late season, it was only by the free use of water that the young plants were enabled to survive, and it was gratifying to find that a beautiful green crop was the result. A preliminary inspection on 19th December showed that the plot with untreated seed was growing most vigorously, and had produced roots 2 inches long, but when in flower there was no perceptible difference between the plots aboveground, and even as regards the nodules, they were apparently equally distributed. Some strong-growing plants in each of the plots were found to be deficient in nodules, while others alongside, and to all appearance similar, were fairly well supplied



G. H. ROBINSON, PHOTO.

Fig. 1.—Experimental lucerne plots at Balwyn just before cutting. The different plots would have been photographed separately, but there was no real distinction between them. Plants 2 to 3 feet high.

with them. The crop was cut on 21st March when in flower, and the plants had grown to an average height of between 2 and 3 feet. The above are the results obtained from the first cutting of the crop, but small plots of the treated and untreated seed were sown at the same time in a poor soil, consisting of grey loam, near Melbourne, and after several cuttings, observations were made on 31st January, 1907. The plants were in flower, and here again there was no striking difference between the different plots. All were about the same height, of equal maturity, and no difference even in the greenness of the leaf where the plants were fully grown. Sample plants with their roots

were carefully removed from each plot, and on examination there was no noticeable difference in the distribution of the nodules. Equal patches from the plot in which the American culture was used, and from the untreated

Fig. 2.—Nodules on lucerne roots—Natural size.

G H ROBINSON, PHOTO

were cut and weighed, and while the former was 3 lb. 8 oz. the latter was 3 lb. 6 oz. thus showing the close agreement between them.

Conclusion.

As far as these results go, they do not show any decided advantage in the treatment of the seed of lucerne with prepared cultures of nitrogen-fixing bacteria, and they bear out the remarks of Mr. Guthrie in the January number of the *Agricultural Gazette:* "Our own experiments with Dr. Moore's cultures, both in pots and in the field, have likewise yielded disappointing results, and the fact is forced upon us that the reports of the remarkable results alleged by the American magazines to have resulted from their use have been much exaggerated." Before, however, any final conclusions can be reached, it will be necessary to test the cultures under various conditions of soil and climate, and in different districts for several seasons.

Now that inoculating material is supplied in the ordinary course of trade and by various agents, it may be necessary to repeat the warning issued from the Laboratory of Bacteriology and Hygiene of the Agricultural College, Michigan: "Closely following the apparent success achieved by Dr. Moore's cultures, several commercial establishments placed inoculating material upon the market. The merits of such cultures have not been established, and they are not controlled by the Government, consequently their real value is unknown. The person who invests in such cultures is doing so entirely at his own risk—is taking a leap in the dark. By paying a large price to try an experiment in which the actual possibilities of gain have not been firmly established, he renders himself subject to utter failure as well as possible success."

Notes on Western Timbers.

In the February, 1907, *Gazette*, page 143, Mr. R. J. Dalton, of Tingapagee, Wanaaring, Paroo River, furnished some notes on Western timbers to supplement Mr. Maiden's notes on the uses of timbers in the April, 1906, *Gazette*. In these notes Mr. Dalton states, with regard to Belah:—

"No use for posts or outside work."

Mr. N. Alcorn McKell, Calga, Gulargambone, kindly sends the following note:—

"On the Bogan River, on the eastern side of which this species is very thick, when a fencing contract is let, Box, Coolabah, or old split Belah are the timbers enumerated for posts, and I think the latter would hardly be specified had its utility been tried and 'found wanting.' The Belah must be old, and split timber (8 in. x 4 in.) only used, and as lasting a fence is made as from any other timber—Beefwood perhaps excepted. For strainers it is of no use, for when left in the round it splits quickly. Belah saplings (green) are used for drop fencing round sheep yards, and battens not less than 2 inches through are used as droppers in six-wire fences. Young Belah is good scrub-feed, sheep eating it readily."

Economic Entomology and Current Literature, 1906.

WALTER W. FROGGATT, F.L.S.,
Government Entomologist.

DURING the last year a great number of important papers dealing with economic entomology have been received by the Entomological Branch. Most of these in America are published as special bulletins of the different State experimental farms or agricultural colleges; those from other countries are issued chiefly as annual reports. As there are many interesting facts disclosed in these papers that are not likely to otherwise come under the notice of the readers of this journal, I propose to give a brief abstract of some of the most important ones from an economic point of view.

In these pages it will be clearly shown that Australia is not the only country where insect pests are a very serious question to all classes of producers.

The Association of Economic Entomologists held their eighteenth annual meeting at New Orleans in the first week of January, 1906, with Mr. F. L. Washburn in the chair. During the four days of its meeting, thirty-two papers were read by the members on all phases of economic entomology. Though many of these papers treat of insect pests confined to America, there are many cosmopolitan insects dealt with, and the notes on spraying and fumigation are of great interest to all entomologists.

"The History of Economic Entomology in Hawaii," by J. Kotinsky, is one of great interest to Australian entomologists, as an impartial account of the parasites introduced into these islands, and the work they have done in keeping in check the various pests of the sugarcane and coffee plants. He gives an account of the introduction of the Sugarcane Leaf-hopper (*Perkinsiella saccharicida*, Kirk.) into Hawaii from Queensland about 1897, the damage it did in the sugarcane fields, and the native Australian parasites that have been collected by Messrs. Koebele and Perkins in North Queensland, and distributed in Hawaii to fight the pest. The Lantana, which has overgrown a great deal of the best land on the island, was first attacked by an accidentally-introduced scale, *Orthezia insignis*, an insect very dangerous to vegetation of all kinds. Koebele went to Mexico to get parasites, not only to kill this scale, but to find a safer one to destroy the Lantana, and was so successful that Kotinsky states that "the primary object of ridding the country of Lantana is well-nigh accomplished."

"Sulphur Dioxide as an Insecticide," by C. L. Marlatt, is another interesting paper, reporting a number of experiments carried out with fumigation of seeds, plants, and houses, with burning sulphur. While proving that it can be used with advantage in houses when pumped into the closed-up rooms, it is too dangerous to use on living plants, and affects the germinating power of seeds if used long enough to kill weevils infesting the seeds.

"The Mango Weevil (*Cryptorhynchus mangifera*)" is the title of Press Bulletin No. 17, of the Hawaii Agricultural Experiment Station, written by D. L. Van Dine. This small weevil has only recently been found in mango seeds in Hawaii, but it has been a well-known pest in many places, from Madagascar, through India, Ceylon, Java, and many of the Malayan islands for many years. In India, according to Cotes, it sometimes infests every mango in the plantations. The beetle lays its egg in the rind of the fruit, the larva feeding into the centre of the seed where it pupates. I have bred a weevil from a mango seed received from Queensland, which may be identical with this pest. The Queensland fruit-growers should be on the watch for this insect, which could be easily introduced from the north.

Mosquitoes come in for a good many reports and bulletins among the American economic work. Coquillett (Technical Series No. 11, Bureau of Entomology, U.S.) classifies the mosquitoes of North and Middle America. In the Bulletin No. 109 of the Maryland Experiment Station the entomologists of the station go into the methods of controlling the mosquito pests by systematic treatment of all stagnant water, and receptacles in which the insects can deposit their eggs.

"The Cattle Tick (Circular No. 10, State Crop Pest Commission of Louisiana)—Studies of the Egg and Seed Tick stages: A simple method of eradicating the Tick," by Wilmon Newell and M. S. Dougherty Starting in an introduction, they point out that the farmers and planters must move with the times, going in for rotation of crops and scientific methods, and to those who study live stock scientific methods are just as important. The annual losses by cattle-tick in the southern States are estimated, in the Year Book of the United States Department of Agriculture, 1904, at approximately 100,000,000 dollars. The authors point out that Dr. Cooper Curtice was the first to point out the possibility of exterminating the tick upon limited areas by a system of rotation. Professor Morgan, who has also investigated the matter, is convinced that the ticks could, by the proper co-operation of the stock-owner, be entirely eradicated from the southern States. This proposition is based on a knowledge of the life history of the cattle ticks, and some of the notes given are of interest to Australian stock-owners. The ticks were studied in the laboratory at Baton Rouge under natural conditions. The greatest number of eggs deposited by one female was 4,124; the greatest number laid in twenty-four hours was 993. The shortest time on which any single egg hatched was sixteen days, and the longest time required for

hatching others was 178 days; but the latter were in a much lower mean temperature. The greatest length of time that the seed-ticks can live without food is 212 days; larval ticks, therefore, can live after hatching for this length of time without blood. From these observations it was possible to calculate how long it would take for a paddock, kept perfectly free of all stock, to become free of ticks. Therefore, if all stock be removed from one paddock this season, from the next paddock the following season, and if all farmers work together, they can free the land of every tick.

"Texas or Tick Fever, and its Prevention" (United States Department of Agriculture, Farmers' Bulletin No. 258), is the title of a pamphlet by J. R. Mohler, Chief of the Pathological Division. It deals with the question much in the same manner as the last paper in regard to the question of cleaning paddocks by *pasture rotation*. He says: "It is based upon the knowledge that by severing the relation of the fever ticks and the animals upon which they develop, these ticks will perish. To adopt this plan, first divide the infested pasture into two parts, which is best accomplished by a double line of fence, with a 10-foot space between the lines to prevent ticks from crossing from one pasture to another."

Cotton Insects.—Probably the most serious pest in the greater part of the southern portion of the United States is the "Cotton Boll Weevil," a tiny little beetle that bores into the squares, and bolls, and causes them to drop off, often thus destroying the bulk of the crops. Van Dine states that the cotton boll weevil has destroyed over 50,000,000 dollars worth of cotton since its appearance in Texas in 1892.

E. Dwight Saunderson contributes "Some observations on the Cotton Boll Weevil" (United States Department of Agriculture, Bulletin No. 52, Division of Entomology). This contains the conclusions arrived at after two years close study of its habits in Texas. He finds that a very large percentage of the adult weevils die every season from natural causes, without laying eggs. Thus, though a female under ordinary conditions lays about 150 eggs, and the increase at the end of the season should be 625 times greater, yet it averages only sixty-five times. If the increase was equal to the first, no cotton could grow in the infested States. There are usually three broods in the summer, and the beetles do not hibernate until the temperature falls to 60°. He warns the cotton-growers that though dry Paris green has been recommended as a remedy, it is only a partial one, and the remedy or preventative is the destruction of all stalks and remains of the dead cotton plants, in which thousands of the beetles hibernate at the end of the season. He says, "It seems, therefore, that the greatest benefit to the uninfected States would come from the passage in Texas and Louisiana of laws compelling the destruction of the stalks in the fall, and any influence that other States can bring to bear towards this end will do more than anything else to prevent the weevil's entry and subsequent depredations in their States."

"The Boll Weevil: Information concerning its Life-history and Habits," is the title of another paper, by W. Newell (Circular No. 9, State Crop

Pest Commission of Louisiana). He points out the advantage of all farmers being able to recognise this particular beetle, and gives a careful description of its life-history. One important point the Australian States should note, is that this pest can be easily transported in the seeds and hulls of cotton, and, therefore, no seed should be allowed into any part of Australia from America. He says: "No more striking instance of the carriage of weevils in seed-cotton could be given than that by which the weevil was originally carried from the Brownsville region, across a stretch of non-cotton producing country nearly 100 miles in breadth, to Alice (Texas), where the cotton was taken for ginning in 1893-1894.

W. E. Hinds writes on "Proliferation as a factor in the natural control of the Mexican Cotton Boll Weevil" (Bulletin No. 59, United States Bureau of Entomology). In this paper he points out that certain varieties of cotton have the power of proliferation more developed than others. Simply stated, proliferation is the continuous development of cells in tissue formation; so that, when the plant is injured by the boring of the weevil-grubs, it produces so much extra cell tissue that it often crushes the intruder to death. His contention is to cultivate those varieties that have this reproductive power most highly developed, and to thus fight the weevils.

"Report on Miscellaneous Cotton Insects in Texas" is published as Bulletin No. 57, Bureau of Entomology, United States Department of Agriculture. In this, E. Dwight Saunderson gives a general account of a number of the minor pests that damage the cotton plant, and suggests that more careful cultivation, where practicable, will be the ultimate means of keeping most of them within bounds.

"*Black Root*" *disease of Cotton*.—Among the many ills that affect the American cotton-growers, this fungus disease, that attacks the roots and stem of the plants, appears to be one of the most serious, and is spreading over Georgia, North Carolina, South Carolina, Florida, and Arkansas. The origin of this disease has been traced by Dr. Erwin F. Smith to a fungus, which he has named *Neocosmospora vasinfecta*. The spores live in the soil, first attacking the young rootlets in early spring, spreading up the stem, destroying or clogging the sap in the water ducts, and thus starves the plant to death. One of the first symptoms is the wilting of the leaves, from which it is also known as "Wilt disease."

Messrs. Smith and Lewis (Bulletin No. 20, Georgia State Board of Entomology) give an interesting account of this disease, and their investigations and experiments carried out between 1905-1906. The conclusions arrived at by these gentlemen are that the best methods of checking this disease is the breeding of new forms as resistant types of cotton plants.

In the Year Book of the Khedivial Agricultural Society, Cairo, First Report, 1905, Mr. F. C. Willcocks, the Entomologist on the Laboratory Staff, furnishes a series of reports, illustrated with drawings; in this he described a number of cotton pests, several of them cosmopolitan cutworms, well known as pests in Australia. The Cotton Worm (*Prodenia*

littoralis), is reported to be a great pest upon the foliage. It is controlled by a Khedivial Decree, in which all boys between the ages of 10 and 18 are compelled to work at destroying the egg masses and larvæ, in default a week's imprisonment or a fine; and if the parents do not send them to do so they can be fined or imprisoned for a month.

The Egyptian Cotton Boll Worm (*Earias insulana*) has a wide range over the cotton districts of Egypt. This is an interesting moth to Australian entomologists, as we have a closely allied species, *Earias fabia*, which feeds upon hibiscus at Moree in the north-west, and is common upon the cotton in the experimental plots at the Hawkesbury College, Richmond.

Heliothis obsoleta, better known under the name of *H. armigera*, is the true "Cotton Boll Worm" of the United States, and is a pest of maize, peas, tomatoes, and other field crops in Australia. It is well known in the Egyptian cotton fields. *Agrotis ypsilon*, not uncommon in Australia, is called the Cotton and Bersun Cut-worm. It is a pest in Egypt to the young cotton plants, cutting them close to the ground, just as it and the "Bugong Moth" (*Agrotis infusa*) do with our young cabbages.

In the Second Report of the Wellcome Research Laboratories at the Gordon Memorial College, Khartoum, economic entomology is a very important feature. One paper deals with the work against the mosquito in Khartoum and the Anglo-Egyptian Soudan generally, in which the methods of dealing with these pests are described. In the paper on the *Culicidæ*, written by Theobald, a number of new species of mosquitoes are figured and described.

"Biting and Noxious Insects other than Mosquitoes" is a general but interesting report upon different two-winged flies (*Diptera*), in which a great deal of information is gathered from reports sent in by the officers in different parts of the immense territory. The Tsetse Fly (*Glossina morsitans*), and the deadly *G. palpalis*, the transmitter of the human "Trypansome," the latter believed to cause the "Sleeping Disease" that is spreading over Central Africa and causing the death of hundreds of thousands of the native population, are both described and figured in colours.

The last paper is "On some Blood-sucking and other Diptera from the Anglo-Egyptian Soudan, collected during the year 1905, with Descriptions of New Species," by E. E. Austen. In this, a number of new species of *Tabunidæ* and *Muscidæ* are figured and described.

Notes on Sprays.

J. L. Phillips, in Circular No. 1 (new series), Virginia State Crop Pest Commission, gives the following interesting notes on lime and sulphur-wash. He says that the uncooked lime, salt, and sulphur wash, recommended by some of the American experts, where the heat generated by the lime was utilised to mix the other ingredients, has proved very

unreliable. He advocates making this wash without the salt, particularly when used for San José scale and using only sulphur and lime. He gives the following formula and directions:—

Lime-sulphur Wash.—" Secure an iron kettle that will hold about 25 gallons, place over a fire, and put 4 to 5 gallons of water in it. When the water gets warm, add 15 lb. of good unslacked lime; as soon as slacking begins, add 15 lb. of sulphur, and stir the mixture. Continue to stir briskly, so as to mix the sulphur well with the lime, and add boiling water as needed, so as to bring the mass into a thick paste. Stir well while in this condition and smash all lumps; then add enough water to make 15 to 18 gallons. If the sulphur is lumpy, spread it on a floor and mash with a flat shovel, or make into a pasty mass in the kettle, before adding the lime. Boil the mixture vigorously for forty minutes, and then strain into the spray barrel with enough water to make 50 gallons. The better cooked the more effective the wash. Either cold or hot water can be used in diluting the mixture after it has finished cooking, and it is better to add the spray to the water in the barrel than to first put the spray mixture in the barrel and add the water."

Arsenate of Lead Spray for Codling Moth.—The growers in several of the apple-growing districts of Victoria claim that the last year's experience has proved that there is no spray equal to this for destroying codling moth, and that Paris green is quite superseded, and even arsenite of soda (Kedzei's Compound), so much used in South Australia, will give place to this spray. The following are the reasons given:—First, it will not wash off the fruit and foliage if rain comes soon after it has been used; that in Paris green or arsenite of soda compounds the lime is often of inferior quality, or is spent and old before it is used, owing to the ignorance of the user, who thinks that any kind of lime will do for spraying; further, that the arsenic of the spray is apt to burn and damage the foliage; again, that the spray, if properly made, never clogs the pipes or nozzle.

The formula, as used in Victoria, is given by Inspector Prescott in the *Victorian Journal of Agriculture*, and is as follows:—

1 lb. white arsenic.
2 lb. carbonate of soda (crystals).
7 lb. acetate of lead.
360 gallons of water.

The arsenic and soda are boiled for about half an hour until they are dissolved in half a gallon of water. The acetate of lead should be dissolved in 1 gallon of warm water. When cold, the arsenic-soda blend is gradually stirred into the acetate of lead mixture until they are all thoroughly combined. This stock of 1½ gallons will give 12 pints, which can be bottled and securely corked; and each bottle will suffice for 30 gallons of water. The stock in bottles will keep, and can be stored away for any length of time.

The Manufacture of Wine Vinegar on a Small Scale.

M. BLUNNO.

PUT a couple of pints of the wine in a shallow dish, and put it out in the sun. Take a hogshead and fill it only half or two-thirds with the wine to be turned into vinegar. On this pour the two pints, which, after three or four days in the sun, have become decidedly sour, and keep the vessel in ullage in a place where the atmosphere is about 75 or 80 deg. F. After a couple of months the wine is a fairly strong vinegar.

It is to be noted that vinegars are apt to become less sour after they have reached the highest degree of acidity. This is due to the fact that when the *Bacterium aceti* has transformed all the alcohol into acetic acid it will, in default of alcohol, attack the acetic acid itself, and split it into water and carbonic acid gas, hence the weakening of vinegar. To avoid this, once the vinegar has attained a suitable degree of sourness the vessel is kept in a cool and no longer in a warmish place; also the vessel should be filled up.

If the vinegar is not clear it may be fined. The best fining for it is Spanish clay. Gelatine and albumen (white of eggs) finings are not suitable, because gelatine and albumen are slightly soluble in diluted acetic acid, so the vinegar would remain a little dull after the fining.

Spanish clay can be bought in Sydney. The quantity to be used is about 8 ounces for a hogshead. It is sold in lumps, therefore it must be well pounded and reduced to almost an impalpable powder before using.

The powder is placed in a bucket, and a gallon or so of water is poured on it, in which the equivalent of two or three spoonfuls of sulphuric acid is mixed. The powder is stirred now and again for about forty-eight hours, and finally allowed to set; then the water is decanted off and fresh water put on it and the powder stirred again. After twenty-four hours this water is decanted off and a fresh quantity is put on, which is decanted off again, and some vinegar is then run on the powder. The whole is well stirred, and before the Spanish clay settles in the bucket it is poured into the vessel holding the bulk of the vinegar. With a fairly long and clean stick the bulk is well stirred for about twenty minutes or half an hour; then it is allowed to rest. After a month or so the vinegar is drawn off or decanted off with a siphon and put in another vessel.

The vinegar may be filtered instead of fined, and for this purpose one of those conical-shaped filters made of cloth—as used in cordial factories—can be employed.

When the filter is new it should be steeped for about forty-eight hours in a solution made with a gallon of water in which half a pound of washing soda is dissolved. The cloth is wrung out several times during that time and finally is rinsed and wrung several times in fresh water. By doing this the vinegar will not contract the nasty taste of new cloth which otherwise would be inevitable.

As a rule, the first liquid running from the filter is never very bright. Time must be given until the pores of the cloth get clogged with the solid substances floating in the liquid. Then the filter acts more slowly, but the liquid obtained is brighter.

Leaves of the Coral-tree as Fodder.

Mr. G. W. Card, of the Mines Department, recently submitted a sample of leaves of the "Coral-tree," *Erythrina*, to the Director of Agriculture for examination, as they were considered by him as possibly of value as stock food during drought time. The tree thrives almost anywhere, and carries large quantities of foliage; it is easily propagated from cuttings, taken off with a heel, in spring, and inserting them in sandy soil. The sample was submitted by the Director to Mr. Guthrie, Chemist to the Department, who furnished the following analysis .—

	Per cent.
Moisture ...	74·77
Ash ...	1·69
Fibre ...	1·93
Albumenoid ...	3·47
Carbo-hydrates ...	17·81
Ether extract (fat or oil) ...	0·33
	100·00
Nutritive value ...	22
Albumenoid ratio ...	1 to 53

from which it will be seen that there is considerable nourishment in these leaves.

List of Fertilisers in New South Wales.

F. B. GUTHRIE AND L. COHEN.

1907 List.

THE accompanying list of manures obtainable in New South Wales, together with their composition, as guaranteed by the vendors, and their values, is the result of the revision of the list issued in May, 1906.

The list is published in the interest of the farmers, and it is hoped that it may serve as a guide to those requiring any particular class of manure.

It must be clearly understood that the figures given are not those obtained by analysis of the sample by the Department. They represent the guarantees given by the vendors in accordance with the provisions of the Act.

Where possible, samples have been taken from bulk by one of the officers of the Department, and only those manures are inserted in the list which have been found on analysis to be up to the guarantee.

A word is necessary in explanation of the column giving the "values" of the manures. These figures are calculated from the composition of the manures as represented by analysis, a definite unit-value being assigned to each of the fertilising ingredients. The units on which the values here given are computed are as follows:—

UNIT-VALUES of fertilising ingredients in different manures for 1907.

	Per unit. s.	d.
Nitrogen in nitrates	15	7
,, in ammonium salts	13	9
,, in blood, bones, offal, &c.—fine	13	8
Phosphoric acid in bones, offal, &c.—fine	2	10
Potash in sulphate of potash	5	2
Potash in muriate of potash	4	5
Phosphoric acid in superphosphate and mineral phosphate—		
Water-soluble	5	0
Insoluble	2	7

PRICE per lb. of fertilising ingredients in different manures for 1907.

	Pence per lb.
Nitrogen in nitrates	8·3
,, in ammonium salts	7·4
,, in blood, bones, offal, &c.—fine	7·3
Phosphoric acid in bones, offal, &c.—fine	1·5
Potash in sulphate of potash	2·8
Potash in muriate of potash	2·4
Phosphoric acid in superphosphate and mineral phosphate—	
Water-soluble	2·7
Insoluble	1·4

To determine the value of any manure the percentage of each ingredient is multiplied by the unit-value assigned above to that ingredient, the result

being the value per ton of that substance in the manure. For example, a bone-dust contains 4 per cent. nitrogen and 20 per cent. phosphoric acid :—

4 x 13s. 8d. =	£2 14s. 8d. =	value of the nitrogen per ton.
20 x 2s. 10d. =	£2 16s. 8d. =	value of the phosphoric acid per ton
	£5 11s. 4d. =	value of manure per ton.

It must be clearly understood that the value thus assigned, depending solely upon the chemical composition of the manure, does not represent in all cases the actual money value of the manure, which depends upon a variety of causes other than the composition, and is affected by local conditions. Neither does it represent the costs incurred by the manufacturer in the preparation, such as cost of mixing, bagging, labelling, &c. It is simply intended as a standard by which different products may be compared. At the same time, it has been attempted to make the standard indicate as nearly as possible the fair retail price of the manure, and the fact that in the majority of cases the price asked and the value assigned are fairly close shows that the valuation is a reasonable one.

These figures have been checked in all cases by analyses made on samples collected by an officer of the Department. It by no means follows, however, that the particular product analysed and here published will be in stock for any length of time.

Some agents guarantee two figures—for instance, "from 16 to 18 per cent. phosphoric acid." In these cases the lower one has been published in the list, as it will certainly be the one the vendors will rely upon in cases of dispute.

Now that the Fertiliser Adulteration Act is in force, the purchaser has only himself to blame if he pays for an inferior article. Every vendor is obliged to furnish a guarantee with every delivery of fertiliser, setting forth its actual composition as determined by analysis.

If the purchaser has any reason to suspect the genuineness of the guarantee, all he has to do is to notify the vendor of his intention to take samples for analysis, in sufficient time to enable the vendor or some person appointed by him to be present. The samples must be taken before the consignment is finally in the purchaser's possession ; for example, if the fertiliser is sent by rail, the sample should be taken at the railway station or siding. Three samples must be taken, one being given to the vendor or his representative, the second kept by the purchaser and submitted to an analyst, and the third forwarded to the Department of Agriculture for future reference, in case of divergence in the analyses of the other two. All three samples must be sealed up.

In the case of bone-dust, blood, and bone manures, &c., the valuation has been made irrespective of the fineness of the division, and is based on the amounts of fertilising ingredients only ; but it must be borne in mind that finely ground bone-dust acts more rapidly than coarse, and that unground fragments of bone only become available as fertilisers very slowly.

A word may be added in explanation of the term water-soluble phosphoric acid. When bones or mineral phosphates are acted on by sulphuric acid, a

portion of the tricalcic phosphate is converted into another lime compound, known as monocalcic phosphate or superphosphate. This compound is soluble in water, and it is to its presence that the rapid action of the phosphate is due. This is the "water-soluble" acid of the table. In many superphosphates, however, a considerable portion of this compound has undergone change. This change may be due to the salts of iron and alumina present, or to the length of time it has been kept, and it results in the formation of a third lime compound—bi-calcic phosphate. This is known as "reverted" or "retrograde" phosphoric acid, and is insoluble in water, but soluble in ammonium citrate.

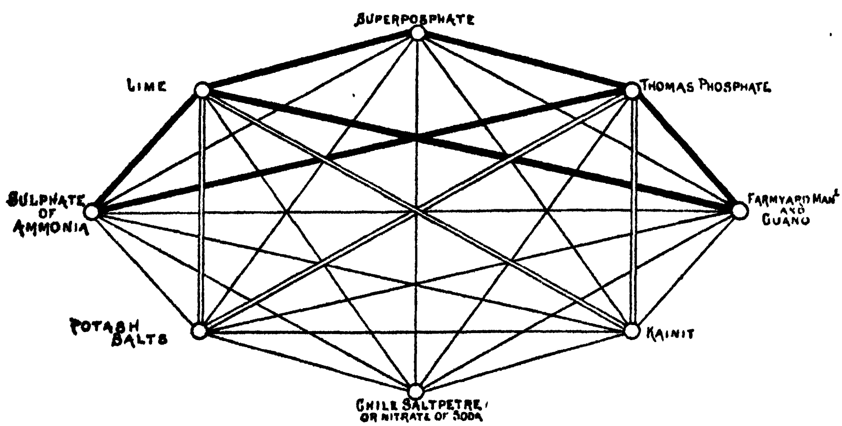
In the fourth table are a number of waste products which may in many cases be economically utilised.

WHEN purchasing a manure always insist on a guarantee of its composition as determined by analysis.

Artificial manures should be mixed with about three times their weight of dry loam, and distributed evenly.

Never add lime to a manure containing sulphate of ammonia or blood and bone manures, as in these cases loss of nitrogen results; and when lime has been applied to the land do not use such manures until about three weeks afterwards.

The accompanying fertiliser diagram, which represents in a graphic manner the points to be taken into consideration in the mixing of different manures, is reproduced in the hope that it will be found useful to farmers who make up their own mixtures. The diagram originates with Dr. Geekens, Alzey, Germany, and is taken from an article by Mr. Leo. Buring in the *Garden and Field* of 10th October, 1903.



Substances connected by thick line must not be mixed together.
Substances connected by double line must only be mixed immediately before use.
Substances connected by single thin line may be mixed together at any time.

I.—Simple Fertilisers.

Manure.	Where obtainable.	Guaranteed Composition.					Manurial Value.
		Nitrogen.	Equivalent to Ammonia.	Lime (CaO.)	Potash (K_2O).	Phosphoric Acid (P_2O_5).	£ s. d.
Sulphate of Ammonia...	Australian Gaslight Co., Kent-street, and any manure agent.	20·40	24·77	..	..	.. .	14 0 6
Nitrate of Soda...	Gibbs, Bright, & Co., 37, Pitt-street, and any manure agent.	15·80	19·18	..	. ...	... .	12 6 3
,, ,, ...	"K.P.N." Fertiliser Co., 12, Spring-street ...	10·30	12·51	. .	. ..	.. ..	8 0 6
Kainit	Potash Syndicate, and any manure agent ...	.. ...	.....	..	12·5	..	3 4 7
Muriate of Potash	,, ,, ...	......	.. ..	.. ...	61·54	......	13 11 10
Sulphate of Potash	,, ,, ...	......	. .	.. ..	52·4	.....	13 10 9
Thomas Phosphate	A. H. Hasell & Co., 2, Bridge-street	......	......	.. ...	......	18·0	....
,, ,, ...	"K.P.N." Fertiliser Co., 12, Spring-street ..	......	.. ...	......	.....	17·20	....
Building Lime*...	Sydney and North Sydney Lime and Cement Co., 17, Pitt-street.	......	... .	95· (about)	......	......	....
Agricultural Lime*	,, ,, ...	......	.. ...	60· (about)	......	......	.. ..
Gypsum Fertiliser*	A. H. Hasell, 2, Bridge-street	......	......	98 % crystallised $CaSo_4$	... .	......	....

* Lime and Gypsum not guaranteed.

II.—Bone and Blood Manures.

Manure.	Where obtainable.	Guaranteed Composition. Nitrogen.	Equivalent to Ammonia.	Phosphoric Acid.	Equivalent to Tri-calcic Phosphate.	Manurial Value. £ s. d.
Bone-dust digested, 40 per cent. ...	Co-operative Wholesale Society, 36–37, Royal Exchange.	3·5	4·13	18·3	40·0	4 19 8
Special fertiliser, No. 3	" " " "	5·0	6·07	18·3	40·0	6 0 2
Dried blood	Waratah Fertiliser Co., Ida-street, Waratah. ..	11·5	13·96	....	......	7 17 2
Bone-dust	" " " "	4·12	5·00	22·9	50·0	6 1 2
Dried blood	Colonial Fertilisers Co., 117, Pitt-street	10·7	13·00	......	......	7 6 3
Bone-dust, B.D. 2	Paton, Burns, & Co., Commercial Chambers, corner Sussex and King Streets.	3·7	4·49	22·12	48·29	5 13 3
" B.D. 3 ...	" " " "	3·3	4·00	20·7	45·19	5 3 9
" B.D. 4	" " " "	3·3	4·00	18·4	40·17	4 17 3
Bone and blood, B.B.	" " " "	5·35	6·50	11·91	26·0	5 6 10
Blood	" " " "	10·70	13·00	......	.....	7 6 3
Bone and blood manure	R. S. Lamb & Co., 55, Pitt-street. ...	5·76	7·00	13·74	30·	5 17 8
Green's A 1 bone-dust	" " " ...	4·12	5·00	18·78	41·	5 9 6
* * * bone-dust	" " "	3·91	4·75	23·82	52·	6 0 11
Raw bone-dust	" " " ...	3·91	4·75	23·82	52·	6 0 11
Vulture manure	" " "	3·09	3·75	18·32	40·	4 14 2
Raw or green bone-dust	A. Wooster, Epping	4·01	4·86	24·41	53·30	6 4 0
Blood and bone-dust .. .	" "	5·76	7·00	13·74	30·0	5 17 8
Pure steamed bone-dust	" "	3·91	4·75	24·50	53·5	6 2 10
Blood and bone manure ..	A. H. Hasell, 2, Bridge-street ...	5·5	6·68	17·97	39·24	6 6 1
Bone-dust	" " ..	4·26	5·17	22·35	48·8	6 1 7
Blood and bone manure	Geo. Shirley & Co., 52 and 54, Pitt-street	5·0	6·07	13·0	28·38	5 6 0

III.—Superphosphates, Mixed Fertilisers, and Imported Fertilisers.

Manure.	Where obtainable.	Guaranteed Composition. Nitrogen.	Water soluble Phosphoric Acid.	Total Phosphoric Acid.	Potash (K_2O).	Manurial Value.
						£ s. d.
Ohlendorff's Dissolved Peruvian Guano.	Gibbs, Bright, & Co., 37, Pitt-street	5 0	9·0	10·0	1·5	6 4 1
Superphosphate	"K.P.N." Fertiliser Co., 12, Spring-street ...	.	17·0	.. ...	. . .	4 5 0
Superphosphate (concentrated).	,, ,, ,, ..		41·9	......	......	10 9 6
A1 Superphosphate ..	Geo. Shirley & Co , 52 and 54, Pitt-street		18·78	.. ...	.. ..	4 13 11
Superphosphate No. 1 .	,, ,, ...		16·49	....	. .	4 2 5
Hasell's Royal Superphosphate.	A. H. Hasell & Co., 2, Bridge-street		17·5	... ..	.	4 7 6
Hasell's A1 Japanese Superphosphate.	,, ,, ...		20·0	.. ...	. .	5 0 0
Hasell's Marion Guano . .	,, ,, ...	.	......	27·48	.	3 11 0
Guano	Paton, Burns, & Co., Commercial Chambers, corner King and Sussex streets.	..	... ..	27·48	. ....	3 11 0
Special Potato Fertiliser...	A. Wooster, Epping	4·52	.....	14·91	5·0	6 6 1
Complete Fertiliser ...	,, ,, ...	5·01	... ..	14·56	2·0	5 16 5

IV.—Waste-Products, Ashes, &c.

Manure.	Where obtainable.	Water.	Volatile and Combustible.	Nitrogen.	Ammonia.	Insoluble.	Lime.	Phosphoric Acid.	Potash.	Value.
										£ s. d.
Deposit from wool-scouring tanks. 1	Liverpool Wool-scouring Works.	...	...	·64	·78	...	...	...	·72	0 12 6
,, 2	,, ,, ,,	...	...	1·02	1·24	...	...	·16	·39	0 16 5
,, 3	,, ,, ,,	...	...	1·37	1·66	...	...	·14	·20	1 0 2
Deposit from breakers	,, ,, ,,	34·47		1·81	2·20	50·68	·85	·88	1·60	1 15 6
Sediment from wool-scouring works.	Yass	19·57		·59	·71	78·24	·97	...	·20	0 9 1
Wool-waste	...	...	...	8 15	9·89	...	...	...	...	5 11 5
"Skutch" from limed pelts	Hugh Wright, Auburn	5·32	73·42	1·80	2·18	3·61	9·36	·89	·20	1 8 2
Decomposed hair and lime	Fellmongery	9·70	57·08	6·86	8·33	1·22	26·27	...	...	4 13 9
Tan-yard refuse	Tanneries, St. Marys	6·43	33·83	2·24	2·72	21·43	26·96	·67	...	1 12 6
Filter-press muck	Cane-mills, Broadwater	16·39	26·07	·22	·27	34·86	13·20	5·98*	·44	1 12 10
Megass	Clarence River cane	22·86	67·32	·63	·78	8·61	·30	·01	·05	0 8 11
Megass-ash	,, ,,	...	...	...	...	87·69	3·07	·16	·51	0 3 1
,,	Richmond ,,	...	...	...	...	...	1·11	·28	4·79	1 5 7
Bloodwood-ash	...	...	...	...	...	...	8 47	·27	5·25	1 7 11
Ironbark-ash	...	...	...	...	...	...	...	·82	1·53	0 10 3
Blackbutt-ash	...	...	...	...	...	...	7·27	·04	2·02	0 10 7
Red-gum-ash	...	...	...	...	...	...	...	·38	4·17	1 2 7
Spotted-gum-ash	...	...	...	...	...	...	...	·10	·70	0 3 11
Boxwood-ash	...	...	...	...	...	...	...	·67	1·65	0 10 5
Sea-weed-ash	...	...	...	...	...	...	9·27	·49	·59	0 4 5
Sea-weed-ash	...	...	...	...	...	...	6·29	1·27	17·55	4 14 3
Ash of grass-tree (*Xanthorrhœa arborea*).	...	0·86	1·78†	...	...	33·48	24·94	3·07	5·30	1 16 1
Vine-cuttings-ash	...	·49	...	...	...	60·64	11·34	1·85	3·76	1 4 8
Red-apple-ash	...	...	...	...	...	54·52	14·96	0·47	6·00	1 12 4
Ash of kerosene shale	Hartley Vale	1·49	27·93	·70	·85	67·59	...	·28	·14	0 11 1
She-oak-ash	...	...	...	...	...	8·57	42·35	8·85	2·19	1 16 5
Sea-weed, fresh state	...	80·00	...	·16	...	...	·41	·09	1·18	0 8 6
Sawdust	...	32·52	62·35	·82	1·00	...	...	1·70	·05	0 16 3
Cave-deposit, shells, &c.	Cowan, Hawkesbury River	2·11	...	·82	·99	...	35·40	1·59	·88	1 0 3
,,	Macleay River	23·06	16·01	2·43	2·95	26·77	13·88	7·40	...	2 14 2
Gypsum	Marulan		(Crystallised $CaSO_4$ = 92·64.)			4·47	...	...	...	...
Flue-deposit	Maitland	...	...	...	...	83·75	2·56	·32	·31	0 2 6
,,	Liverpool	...	...	...	...	91·17	·42	1·29	·17	0 4 6
,, from sanitary furnace	...	...	...	...	...	63·53	6·64	1·82	1·61	0 13 6
Night-soil mixed with lime	...	44·33		·74	·89	18·60	27·62	·78	...	0 12 4
Night-soil	Wagga Wagga	6·70		·03	0·4	82·19	·44	·28	·69	0 4 9
,,	,,	9·14		·28	·34	78·92	1·18	·18	·54	0 7 2
,,	,,	...		·50	·61	...	...	·64	·62	0 11 10

* 5 per cent. soluble in water. † Unburnt carbon.

IV.—Waste-Products, Ashes, &c.—*continued.*

Manure.	Where obtainable.	Water.	Volatile and Combustible.	Nitrogen.	Ammonia.	Insoluble.	Lime.	Phosphoric Acid.	Potash.	Value. £ s. d.
Night-soil preparation, No. 1 (*a*)	Wagga Wagga	8·22		3·73	4·63	50·22	13·32	9·65	·91	4 13 7
" " No. 2 (*b*)	....	7·20		1·83	2·22	29·02	6·05	4·10	·15	2 4 0
" " No. 3 (*c*)	....	25·95		1·64	1·99	60 17	1·39	1·61	·70	1 11 6
" preparation, "Pinhoe" manure.	....	·92	9·54	·21	·25	57·58	14·71	1·26	·56	0 9 4
Night-soil preparation, No. 1 ..	F. Artlett, Parramatta .	7·33	30·06	2·10	2·55	46·38	3·74	1·92	·61	1 17 4
" " ..	"	10·11	42·59	4·97	6·03	·94	$CaCO_3$ 30·12	·39	....	3 9 1
" " ..	Mr. Halstead, O'Brien's patent.	1·54	12·36	·54	·65	77·95	.. ..	·63	....	0 9 2
Farmyard-manure	....	67·96	22·09	·40	·49	8·16	·16	·20	·30	0 7 7
Fowl-manure	....	3·95	16·48	1·47	1·78	70·16	2·10	1·94	....	1 5 7
"	....	1·54	15·23	·86	1·04	79·96	·64	·59	·33	0 15 2
Flying-fox-manure	....	1·09	35·34	3·34	4·05	50·29	1·02	0·36	1·15	2 12 7
Fish-manure	....	10·88	59·26	6·10	7·40	5·39	9·82	8·28	....	5 6 10
Sheep-manure	Liverpool Wool-scouring Works.	9·71	50·91	1·79	2·17	32·26	2· 0	·91	·92	1 11 10
Bat-guano	....	14·11	17·69	1·55	·88	28·77	13·72	11·42*	. ...	2 15 8
Bat-guano†	....	10·86	19·65	2·24	2·72	51·95	1·75	3·55	·15	2 3 8
Bat-guano‡	....	13·70	34·35	4·76	5·78	3·30	22·28	13·04	trace	5 5 4
Bat-deposit	Cave Flat, Cooradigbee .	5 43	12·98	·50	·61	57·64	5·60	12·12	....	2 1 2
Decayed wood (bark and leaves), bloodwood.	....	57·80		·74	·89	40·68	1·30	....	....	0 10 1
Decayed wood (bark and leaves), pepper tree.	....	79·92		·89	1·08	17·77	1·50	....	....	0 12 2
Muck from waterworks reservoir	Maitland	4·84	17·55	·74	·90	63·42	4·56	·31	·60	0 14 1
Cocoa-nut oil cake	Lever Brothers ..	8·24	...	3·29	3·99	....	. .	1·20	1·49	2 16 1
Bean-cake	North China .. .	14·52	80·32	6·77	8·22	....	...	1·33	1·99	5 6 7
Field-pea, whole plant ..	... .	88 58	9·97	·55	·67	....	·15	·12	·49	0 13 5
Tares, whole plant .. .	.. ..	83·97	14·96	·73	·88	. . .	. . .	·11	·21	0 11 5
Marsh-mallow, whole plant .	... .	79·00	17·86	·85	1·03	...	....	·14	·69	0 15 7
Air-slacked lime	....	16·58	... ..	....	....	1·88	75·44	....	....	....
Residue from calcium carbide ..	....	41·36	... .. .	....	....	1·08	36·19	..... .	.. .. ..	.. ..
Rice husks	....	42·71	42·15	1·07	1·30	13·77	·02	·03	·04	0 14 11
Sea-weed ash	Manly . ..	.. .. ..	.. ..	....	..... .	43·06	6·52	·91	13·98	3 14 10
"	" .. .	....	....	....	.. .. ..	·07	·53	·19	34·30	8 17 9
Muck raked from a water-hole ..	....	63·66	29·86	·81	·98	3·80	·96	·10	·06	0 11 8
Clinker from locomotive boiler .	....	.. .. ..		....	....	.. ..	....	....	0·25	0 1 4
Bone breccia..	Queanbeyan .. .	5·71	... .	·59	·72	9·48	42·80	3·11	....	0 16 11
Castor cake	....	18·81	74·08	4·30	5·22	....	....	1·83	0·86	3 8 5
Pea cake	Java	16·02	....	7·24	8·79	....	....	1·46	1·17	5 9 2

* 1 per cent. of the phosphoric acid is water-soluble. † The total nitrogen contains 1·12 nitric nitrogen, ·84 ammoniacal nitrogen, ·28 organic nitrogen. ‡ This analysis was made by Mr. J. C. H. Mingaye, and the total nitrogen contains 1·70 nitric nitrogen, ·64 ammoniacal nitrogen, and 2·42 organic nitrogen.
a 4·86 per cent. phosphoric acid is water-soluble. *b* 3·03 per cent. phosphoric acid is water-soluble. *c* ·42 per cent. phosphoric acid is water-soluble.

Report of the Superintendent of the Cold Storage and Export Branch.

H. V. JACKSON,
Department of Agriculture.

I HAVE the honor to submit particulars of the operations at the Government Cold Stores for the twelve months ending 31st December, 1906.

It will be seen from the particulars given that 2,713,410 rabbits and 9,372 hares were delivered from the stores; while 10,457 head of poultry were prepared for export; and 7,706 cases of eggs, representing 277,416 dozen, were held in the stores. The total value of the goods handled being £79,624 8s. 10d.

The quantity of rabbits handled was very large, and, as will be seen from the tabulated statement, a very fair proportion of them were handled in the months of May, June, July, and August.

In consequence of the very large quantity of rabbits, the Department made arrangements with the Fresh Food and Ice Company, Limited, for a certain amount of freezing accommodation, and some 40,000 crates of rabbits were frozen at the above company's works for the Department. The season may be described as a successful one taking into consideration the immense quantity of rabbits dealt with in the State, it being estimated that 5,939,240 pairs of rabbits and hares were exported, value £246,489. 7,527,265 lb. of rabbit and hare skins, value £297,792 were exported, so that the rabbit and hare carcases and skins combined make a total value of £544,281.

The reports from the Agent-General of New South Wales in London have been to the effect that, on the whole, the New South Wales rabbits were satisfactory, and the cabled reports as to prices, as also the advices from the Agent-General, show New South Wales rabbits were holding their own in the market, bringing the best prices. This is exceedingly satisfactory considering the large quantities handled at freezing works during the 1906 season.

In the Regulations provided by the Department for 1907 it is laid down that the Government will stipulate what daily quantities shall be supplied at the Government Cold Stores by respective parties or firms. It may be admitted that it is difficult for firms to know exactly what quantities of rabbits they may obtain at various points from the country, and what will arrive at the Sydney Depôts on given days, but it certainly is possible to exercise some amount of discretion in buying in the country.

There have been occasional complaints as to the condition of an odd parcel of New South Wales rabbits on the London market, some of the complaints mainly referring to a staleness existing in the rabbits, and in a few instances to rabbits opening up of less weight than when originally packed.

With reference to complaints of stale rabbits on arrival at Home Ports.—The grading of rabbits here does not affect, nor is it a factor that will account for such a condition. Rabbits that are tending to staleness are neither passed nor packed, and in frozen rabbits staleness is a condition which arises from prolonged storage either ashore or afloat. As to the quality of rabbits whether on the lean side or fat, that is a condition dependent entirely upon the weather and pasturage conditions generally throughout the State and to various districts. During long storage rabbits will lose weight. A large quantity of rabbits were packed at freezing works in the country, and it is exceedingly satisfactory to be able to note that the rabbits from such works have been, and are still gaining excellent reputation. I have seen fears expressed occasionally by London buyers of the possibility of rabbits deteriorating in transit from the country to Sydney. The trucking to Sydney of the packed rabbits in refrigerated cars does not detract from condition, as they arrive perfectly hard and cold always provided the rabbits have been hard frozen before being trucked.

In consequence of the Commonwealth Commerce (Trade Descriptons) Act having come into force on the 1st of October last, the rabbits packed during the 1907 season will have to meet the requirements laid down by the above measure.

In a manner of speaking State Government grading and stamping is now supplanted by the Commonwealth system of inspection and classification for quality, and under the Commerce Act the term "grading" is not used. An exporter of certain products scheduled under the Commerce Act Regulations has to make a certain trade description on packages, and the Commonwealth Inspector, so far as he is able, checks the veracity of the description given, and in the case of meat it has to be declared sound and fit for human consumption. It will be seen, therefore, that the so-called Government grading which has for some years been in vogue in New South Wales under a voluntary system is now, to an extent, superseded by the system of Commonwealth inspection. I have reason to believe that exporters and packers have been or are disposed to regard particulars given on crates as a Departmental pronouncement—such, however, is not so. Any particulars on crates of rabbits are a trade description of the owner of the rabbits.

The Government of New South Wales does not make or imply any contract with freezing companies, exporters, packers, or any person, in its supervision of rabbit grading or classification, such action being purely voluntary and for the purpose of facilitating trade.

In connection with the work of graders, while every effort is made to maintain standards, the Government does not guarantee that all rabbits or crates of rabbits will be of full stated weight. Light weights or other defects of any nature are circumstances in respect of which buyers and sellers must take their own risks, and make their own provisions, and wherein the Government accepts no liability whatsoever.

There apparently are some people who think that the minimum individual weights of rabbits should correspond exactly with that printed on the cases.

Rabbits, like all other frozen goods, lose weight considerably during the freezing process and a prolonged storing period; and considering that the goods may be packed many months previous to being opened up, and also that they may have gone through the varying temperatures of ships' holds, it is quite impracticable to attempt to assure the same weight will be forthcoming as was experienced at the time the goods were packed. Although not in any way responsible for statements as to weights of rabbits in crates, either in London or Australia, yet the Department believes it to be in the interests of traders at both ends that anything tending to misunderstandings should, if possible, be removed, and therefore it is pointed out the descriptions applied to rabbits refer to them in an unfrozen state at the immediate moment of packing.

With the object of perhaps making the position clear to the minds of purchasers at a distance, the Department recently gazetted a regulation authorising the word "about" to precede that of the weight, so as to read "about 2½ lb. or over," &c.; at the same time, the use of the word is not compulsory. Weight shrinkage is accounted for in all other classes of frozen products; but up to the present the rabbit trade does not appear to have recognised this, notwithstanding that owing to the exceedingly moist nature of the rabbit carcase it is natural to assume there is considerable wastage by evaporation, &c.

Purchasers should carefully note that the markings on crates and stamping of same applies to the goods in an unfrozen condition at time of packing.

The following figures show the total quantities received in previous years:—

Rabbits and Hares.

1901 ...	Rabbits (pairs) .	80,351	Hares (single) ...	124,666
1902 ...	,, .	113,125	,, ...	64,448
1903 ...	,, ..	640,541	,, ...	42,796
1904 ...	,,	915,999	,, ...	53,616
1905 ...	,,	1,460,292	,, ...	86,352
1906 ...	,, ..	1,356,705	,, ..	9,372

RECEIPTS—1906.

Month.	Fowls.	Ducks.	Geese.	Turkeys.	Rabbits in Fur.	Rabbits Skinned.	Hares.	Eggs.	Milk.	Poultry.	Cheese.
					pairs.			cases.	cases.	crates.	crates.
January	1,434	100	88	8	3,012	..	..	46	230	10	12
February	977	647	25	8	8,304	..	..	8	258	7	9
March	1,289	251	.	158	20,316		..	34	284	15	10
April	534	..	68	52	133,272	..	.	..	292	9	8
May..	579	..	..	38	479,268	4,920	852	..	339	38	..
June . ..	202	456	.	112	158,735	7,770	1,092	..	338	37	..
July	228	131	25	250	257,592	16,350	1,272	..	268	34	..
August	12	22	..	259	211,620	35,580	4,128	..	306	50	..
September ..	..	10	..	48	48,800	4,950	1,872	1,516	217	12	..
October	255	..	.	23	5,904	..	156	1,750	361	1	..
November.. ..	..	..	..	..	....	..	..	662	358	33	5
December	..	..	100	4	96	..	..	75	280	66	3
Total	5,510	1,617	306	960	1,321,920	69,570	9,372	4,091	3,531	312	42

DELIVERIES—1906.

Month.	Fowls.	Ducks.	Geese.	Turkeys.	Rabbits in Fur.	Rabbits Skinned.	Hares.	Eggs.	Milk.	Poultry.	Cheese.
					pairs.			cases.	cases.	crates.	crates.
January	1,747	70	36	16	...	..	.	90	306	7	10
February . .	..	..	..	..	7,176	.	..	400	244	4	13
March ..	2,705	1,136	29	16	12,828	.	.	1,030	304	16	11
April ..	545	132		129	..	..	.	2,133	267	13	6
May.. .. .	1,151	60		81	147,108		.	2,113	290	9	6
June .. .	584	57	92	..	318,444		264	1,489	334	15	15
July .	65	515	60	66	370,428	7,500	744	273	282	5	8
August ..	442	72	25	102	232,740	24,270	3,156	71	352	20	6
September .	.	22	..	173	218,004	36,900	4,752	..	263	50	..
October .	150	10	..	147	13,416	810	456	..	190	40	.
November..	..	..		22	1,512		.	20	104	42	..
December . .		.		224	264			67	139	76	2
Total	7,389	2,074	242	976	1,321,920	69,570	9,372	7,706	3,075	297	77

With reference to poultry and eggs, Mr. Inspector G. Bradshaw reports as follows :—

The poultry industry, so far as good table fowls are concerned, is, and for many years has been, in the unsatisfactory position of there never being enough to meet local demands, small scraggy sorts being always in abundance. The Agricultural Department, Agricultural and other Societies have long since realised this, and as a means to encourage better quality, have for years been offering substantial prizes to that end, but without success. A few fancy poultry breeders usually compete for these prizes, the market-poultry man rarely troubling himself, possibly believing he knows best what to breed for the local market, and that the winning of a prize or two at the Shows would not pay him for his trouble in exhibiting ; and, unlike the fanciers, would have no after results in better sales, the local market always offering good prices.

The *Daily Telegraph* Newspaper Company in August, 1905, also took the matter in hand by offering £50 of prize money for a table poultry competition. A response of about sixty lots appeared, but again largely from prize or pure-bred poultry men. The quality of many of the birds was excellent, the bulk of them were shipped to London, and returned net from 1s. 1½d. to 3s. 4½d. each, the latter being for birds weighing 5½ lb. to 6 lb. each. A few of the owners said the price paid them ; others, that the local market was best. The actual results in our markets were, however, nil, the scarcity of good table fowls being more pronounced in 1906 than for very many years, this contributing to prices higher than are obtainable in almost any other part of the world. Cereal and other poultry foods were throughout the year obtainable at a moderate cost, which, with the good local demand, made the past year a profitable one to those whose occupation is breeding fowls for the market.

Export Poultry.

The table poultry competitions, its wide publicity, and appearance on the London market caused many to imagine that this State had a large surplus of good table fowls, and throughout the year several cables were received with offers fully up to those received for the competition fowls. It is needless to say there was no response, old hens in the Sydney market at that time realising as much as was offered for the choice birds suitable for England. Even some South African orders had to be refused; while to complete a contract, a firm here had to fall back on Victoria to supply it.

With such favourable local markets for our poultry here, it will be readily understood why the export figures are not up to previous years, a falling off in exports being a true index to a good local demand.

Appended are the quantities received at the Government Stores:—

Year.	Fowls.	Ducks	Geese.	Turkeys.	Total.
1898...	9,411	5,916	522	904	16,753
1899 .	12,570	8,034	404	1,800	22,808
1900.	23,056	15,378	1,316	4,755	44,505
1901 ..	45,999	21,202	1,755	4,184	74,140
1902...	98,462	17,540	1,258	2,892	120,152
1903..	8,628	2,936	40	789	12,393
1904...	820	2,047	......	750	3,617
1905..	6,226	3,577	424	3,389	13,616
1906..	5,510	1,617	306	960	8,393

It should be mentioned that the above does not represent all the poultry which left the State during the year. One or two large poultry establishments shipped quantities oversea which do not go through the Department's stores, while thousands of fowls, ducks, turkeys, and geese leave the State each month for consumption on the big passenger steamers, which regularly leave here for London.

Eggs.

The good market that always obtains for eggs in this State still further improved during the past year, but whether due to a lessened or an increased supply it is difficult to determine. One thing, however, is certain, the returns by rail were nearly 2,000 cases less than in 1905; a considerable shortage was also recorded from the Northern Rivers. It is scarcely possible that production of this article has increased during the year. The high prices obtaining during our cheapest period was responsible for a considerable reduction in the quantities placed in cold storage, this pointing to very high prices during the incoming winter. Taken altogether, those engaged in poultry products have had a prosperous year.

LOCAL VALUE—Goods Delivered.

Quantity.	Goods.	Value.
		£ s. d.
2,713,410	Rabbits	56,239 10 0
9,372	Hares	395 10 0
7,389	Fowls	926 2 6
2,074	Ducks	259 5 0
242	Geese	60 10 0
752	Turkeys	300 16 0
7,706	Eggs (cases)	16,182 12 0
3,075	Milk (cases)	4,305 0 0
297	Poultry (crates)	891 0 0
77	Cheese (crates)	64 3 4
		£79,624 8 10

The principal articles exported oversea from January to December, 1906 are enumerated below :—

Article.		Quantity.		Value.	
		Australian Produce.	Total.	Australian Produce.	Total.
				£	£
Animals—Horses	No.	4,194	4,200	79,963	81,291
Butter ...	lb.	23,973,160	23,973,160	1,003,836	1,003,836
Coal	ton	2,000,631	2,000,631	878,761	878,761
Copper—Ingots and Matte	cwt.	394,828	394,828	1,577,609	1,577,609
Fruits—Fresh	cntl.	46,813	48,411	30,185	31,841
Gold—Coined, Uncoined		......	......	5,811,622	5,939,482
Grain—Wheat	bshl	4,217,235	4,217,235	689,920	689,920
Flour	ton	38,932	38,938	285,418	285,482
Lead	cwt.	797,760	797,932	650,852	650,995
Leather		......	......	329,305	336,551
Meats—Beef	lb.	3,679,265	3,679,265	41,602	41,602
Mutton and Lamb	lb.	50,913,070	50,913,070	537,818	537,818
Rabbits and Hares	pairs	5,939,240	5,939,240	246,489	246,489
Meat—Preserved	lb.	4,176,315	4,184,523	84,476	84,653
Oil—Cocoanut	ton	13,229	13,231	151,292	151,317
Ores		......	......	840,952	844,446
Silver Bullion	oz	644,233	849,771	79,720	104,810
Silver-lead Bullion	cwt.	705,642	705,642	684,499	684,499
Skins—Hides	No.	130,539	130,539	146,771	146,771
Sheep	No.	3,116,772	3,117,054	403,426	403,472
Rabbit and Hare	lb.	7,527,265	7,527,265	297,792	297,792
Other		......	......	415,192	415,479
Tallow	cwt.	363,941	363,989	470,474	470,538
Timber		......	......	345,795	360,940
Tin—Ingots	cwt.	85,413	85,483	761,862	761,999
Wine	gal.	44,723	47,764	11,819	15,255
Wool	lb.	237,647,285	237,647,285	12,306,944	12,306,944
Other Articles		......	......	758,636	1,667,682
Total	£	......	......	29,923,030	31,018,274

NOTE.—The difference between the value of Australian produce exported and the total export represents the value of produce of oversea origin re-exported.

The Average Wholesale Prices in Sydney of New South Wales Agricultural and Dairy Produce—Monthly.

Month.	Wheat (milling).	Flour.	Bran.	Pollard.	Oats.	Maize.
	per bushel.	per ton.	per bushel.	per bushel.	per bushel.	per bushel.
1905.	s. d.	£ s. d.	d.	d.	s. d.	s. d.
December	3 8	8 2 6	10¾	12¼	2 11	4 5
1906.						
January	3 2½	7 15 0	9½	11¾	2 10½	4 2
February .	3 1⅝	7 9 9	10¾	11	2 8¾	3 11¼
March	3 2¼	7 7 9	9⅞	9⅞	2 7⅜	3 11½
April . ..	3 4	7 6 9	10⅛	10⅛	2 10¾	2 9
May.	3 5⅝	7 13 6	11⅝	11⅝	3 2¼	2 7¼
June . ..	3 6	7 17 6	11	11	3 3¾	2 8
July .	3 5⅞	7 15 0	10⅜	10½	3 4¼	2 10
August	3 5½	7 15 0	10	10	3 4	2 11
September	3 3⅝	7 13 0	9⅛	9½	3 3	2 8¾
October . .	3 2¾	7 9 9	8¾	10	2 7	2 6¾
November .. .	3 0⅜	7 7 6	7½	9¾	2 1⅝	2 6⅝
December . ..	3 0	7 7 6	7¾	9	2 2	2 5½

Month.	Hay (oaten).	Butter (best brands).	Cheese (loaf)	Bacon (sides).	Lard (bulk).	Eggs.
	per ton.	per lb.	per lb.	per lb.	per lb.	per doz.
1905.	£ s. d.	d	d	d.	d.	d.
December	3 5 0	10⅞	5⅝	6⅜	5	9¾
1906.						
January	4 1 6	11¼	5½	6½	5⅛	8¾
February	3 4 6	10¾	5⅝	7½	5⅛	11
March	3 11 9	10⅛	5⅞	7¾	5¼	12⅜
April .	3 7 0	9⅛	5¾	6⅞	5⅜	14⅛
May	3 15 0	9⅞	5¾	6	5½	13½
June	3 18 6	10⅝	6¼	5⅝	5½	13⅞
July...	3 14 0	11	6	6	5¼	11
August	3 14 3	12⅛	6	6¾	5⅛	7¼
September	3 13 6	11¾	6	7⅛	5¼	6¾
October . .	3 14 3	11⅜	6	7⅞	5⅜	6¾
November	2 15 0	10½	5⅞	8	5½	7⅛
December	3 5 9	9¾	5½	7¾	5⅛	8¾

Particulars of Shipping.*

Year.	Entered.		Cleared.		Tonnage Entered.		Tonnage Cleared.	
	Vessels.	Tonnage.	Vessels.	Tonnage.	Steam.	Sailing.	Steam.	Sailing.
1906	2,893	5,283,719	2,883	5,275,031	4,659,821	623,898	4,658,235	616,796

* Statistical items *re* Exports and Shipping *vide* Statistical Bulletin, December, 1906.

Seasonable Notes.

GEO. L. SUTTON,
Wheat Experimentalist.

Preparation and Planting.—The preparation of the soil and early planting will be in order this month. It is the general opinion that early sowing—March and early in April—is advisable, but whilst this may have been true in the past, it must not be forgotten that new varieties which mature more rapidly than the old ones are now being generally grown, and, in consequence of this, a practice which was in order a few years ago may now require modification. From the results of two years' experiments at Cowra, and from reports received from other districts, it is very improbable that sowings of varieties like Federation and Bobs, if made in March or early in April, will prove as profitable as those made towards the end of April and in May. To sow varieties like those referred to, and earlier ones like Bunyip and Firbank, in March or early in April is to court failure. If circumstances demand that planting be commenced earlier this month, a start should be made with the later varieties.

If the chief reason for planting is to obtain a supply of succulent feed for sheep or dairy cattle during the winter, and the production of grain is only a secondary object, the sooner the crop is in the ground the better the results will be.

Whilst it is quite possible to plant too soon, it is very questionable whether the preparation of the soil can be commenced too early, so that the intention to plant the newer varieties should not be construed into a reason for delaying the planting, but rather considered an advantage in that it affords greater opportunities for more thoroughly preparing the seed bed.

At this date, when the want of rain is being keenly felt in some districts, and in consequence of which ploughing cannot proceed, the advantages of a well-worked fallow are plainly evident. The fortunate possessors of such land can commence planting when most convenient to them, even if no rain falls for the next month or two.

Take-all.—This disease was extremely prevalent last season throughout the State; the loss through it must have been very great. At the Cowra Farm it was found on new land and on old land, on manured land and unmanured land; but *not* on land which had been well worked with disc-harrow and cultivator after ploughing. This fact, which shows the value of one of the recommendations made by Dr. Cobb in 1892, for its prevention, affords farmers the clue as to the best means of reducing this pest, even if it does not entirely prevent it.

Dr. Cobb says, "Careful cultivation, which gives the soil a good stirring several times, thereby turning parts of it up to the action of the sun, must

check the growth of fungi in the soil, and in that sense be a benefit." As far as "Take-all" was concerned, the benefits of such a practice were proved at the Cowra Farm by the total absence of "Take-all" on plots so treated, whilst on other plots it was fairly prevalent, though the ground in most cases had never been cropped before.

Thorough cultivation after ploughing, with implements which stir the soil, will certainly reduce this pest, and if this cultivation be carried out in conjunction with a rotation in which wheat is not grown continuously, "Take-all" will certainly be banished from our wheat-fields. The remedy is known; the application of it rests with the farmer.

HAWKESBURY AGRICULTURAL COLLEGE.

MONTHLY WEATHER REPORT.

SUMMARY for February, 1907.

Air Pressure (Barometer).			Shade Temperature.				Air Moisture Saturation = 100.			Evaporation (from Water Surface).			
Lowest.	Highest.	Mean.	Lowest.	Highest.	Mean.	Mean for 15 years.	Lowest.	Highest.	Mean.	Most in a Day	Total for Month.	Monthly Mean for 9 years.	% of year's Evaporation.
29·82 17th	30·28 1st, 20th, 21st.	30·07	51·5 23rd.	100·6 14th.	70·32	72·09	43 19th	100 13th, 26th.	65·7	·283 15th.	5·146	5·884	11

Rainfall.											
Dates	5	7	8	10	12	13	18	26	27	Total,	Mean Rainfall for 15 years,
Points ..	8	78	42	1½	1	2½	8	21	84	246.	224 points.

Wind ...	NE	E	SE	S	SW
	13	1	7	7	4

Thunderstorms on 4th, 5th, 6th, 7th.

Greatest daily range of temperature, 40·6° on 14th.

Days on which temperature rose above 90° $\frac{4}{95}$ $\frac{14}{100·6}$

W. MERVYN CARNE,
Observer.

Weather Conditions during February, 1907.

A. NOBLE,
Officer-in-charge, Meteorological Department.

ON the 1st and 2nd, light to moderate rainfall, associated with thunder, the result of monsoonal agency, fell generally over the north-eastern half of the State.

On the 4th a rather peculiar narrow trough of low pressure extended across southern parts from our South Coast to the head of the Great Australian Bight. In this trough electrical agency gave rise to the development of a rather extraordinary series of thunder and hail storms, beginning in Riverina and extending first east and then northwards, lasting from the 4th to the 13th, and covering about two-thirds of the eastern part of the State. Passing over the Illawarra suburbs on the 7th the hail was very heavy, being as large as pigeons' eggs. Cook's River, with its tributary, the Wolli Creek, became a banker in a very short time, and the flood-waters overflowed on to the adjacent lowlands. On the 8th the storm had passed to north coastal parts; at 5 p.m. Ballina reported vivid lightning and a terrific fall of rain and hail. During the same evening the s.s. "Captain Cook," *en route* from Sydney to Lord Howe Island, experienced a severe thunderstorm starting at 11 p.m., and continuing with only slight intermissions till dusk on the following day, "when the storm burst with renewed fury. For nearly six hours the rain poured down with more than tropical violence without a moment's cessation. It was a perfect deluge, and kept the decks of the steamer awash to a depth of fully 2 inches throughout the disturbance. All the time the lightning was exceptionally brilliant and constant, and the roar of the thunder seemed to find its origin in the body of the ship."

After the 13th the temperature rose steadily inland, culminating on the 14th and 15th. On the former date 111 degrees were reached at Mount Hope, and on the latter date 110 degrees were reached at Brewarrina and Mogil Mogil respectively. On the evening of the 16th a southerly change passed rapidly over the southern district and expanded northwards, causing a general fall in temperature. After this, comparatively cool and pleasant conditions lasted till the 23rd, when a heat wave extended over the south-west parts of our State to Victoria, causing high temperatures generally over that State and our southern districts on the 24th and 25th, whence it moved slowly northwards.

On the 26th a small atmospheric disturbance, with a rainstorm, formed north of Port Macquarie, causing disturbed seas. It rapidly developed, and moved southwards along our coast, attended by violent southerly gales and

high seas. This experience is noteworthy, as it is most unusual for a disturbance of this description to progress so far south—they generally pass away eastwards about Port Macquarie or north of that station.

The month of February as a whole over the State may be classified as a dry one. At a majority of the stations over western, and at a lesser number over southern districts, no rain fell. Otherwise the distribution was very patchy and irregular, due to its association with thunder. Only at a few stations on the North Coast, extending to parts of northern tablelands and also inland at Rockley and Parkes, was the rain above normal. At all other places it was below. Fortunately the shortage in rainfall during February has not been so severely felt, owing to the abundant and general rains which fell during the previous month.

The following table shows the distribution in percentages, above or below normal, over the different subdivisions of the State for February:—

	Percentages. Above.		Below.
On the North Coast	21	to	6
Hunter and Manning	10	"	84
Metropolitan Area	—	...	21 to 45
South Coast	—	...	31 to 100
Northern Tablelands ...	34	to	50
Central Tablelands	27	"	96
Southern Tablelands		..	4 to 100
North-western Slopes	-	...	58 to 95
Central-western Slopes ..	18	to	99
South-western Slopes	—	...	60 to 100
North-western Plains		...	28 to 98
Central-western Plains ..	- -	...	35 to 100
Riverina	—	...	47 to 100
Western Division	- -	...	53 to 100

COMPARISON WITH INDIA.

The following statement shows briefly a comparison of weather conditions over India, together with those over Australia, as far as data have been received, for the month of February:—

	Departures from Normal: Pressure.	Departures from Normal: Temperature.	General Conditions. (Referring to the State as a whole.)
India	0·00	−0·3	Very wet.
Brisbane	−·02	+0·4	Moderately wet.
Sydney	+·06	−0·7	Dry.
Perth	−·03	+2·6	Hottest summer since Observatory started.

Field Day at the Bathurst Orchard and Farm.

W. J. ALLEN.

During each year the different Experimental orchards are visited from time to time by a good many parties of fruit-growers, some of whom find it most convenient to look us up in the pruning season, while others choose the season when the fruit is upon the trees and being processed, or perhaps from those who are within reachable distance, we are favoured with several visits during the year, in order that they may see the pruning, spraying, green manure crops, picking and packing fruit, as well as the drying and curing. This latter industry has been much neglected in this State, and in order to show this very important branch of the fruit-growers' work, we are particularly pleased to have those interested visit us during the drying season, and for this reason it is more than probable that our next year's meeting will take place at the Wagga Wagga Experimental Orchard, where large quantities of fruits are evaporated each year.

Field Day at Bathurst Orchard.

In our several orchards will be found planted many varieties of the different fruits which have been so planted for purely educational purposes, and it is only by arranging for special excursions, such as that of the 14th February, to our Bathurst orchard, that we have a chance of bringing together the fruit-growers from different parts of the State to inspect the fruits and criticise our work, whilst also giving them the opportunity of exchanging ideas and comparing notes.

It is claimed by many writers who do not have the time or inclination to visit our orchards that we cannot keep them clean, but it was pleasing to have the testimony of many of the visitors that while they came to give our trees a careful inspection to see whether or not they could find San José scale, Mussell scale, and Woolly Aphis, they had failed to find anything, except two trees with Woolly Aphis, one of which had this pest alive on it, while only dead aphis could be seen on the other, the tree having been fumigated a few days before the meeting. Amongst our visitors were some who, eight or nine years ago, predicted that the Government was only wasting time in trying to grow trees on that land, but who had the manliness to get up before the meeting and confess that they were pleased to testify, not only to the success of the orchard itself, but also that it had been the means of demonstrating that apples could be grown here as well as anywhere else in the State; and owing to the fact that the rainfall is not very heavy and the climate a cool one, there is no reason why apples grown in this or similar climates should not export well. We have already proved that some winter varieties will keep for months if stored in a cool room, and provided that apple-growing should develop into a large industry in this and surrounding districts, there is no place where co-operation among the growers could more easily be carried out, as they have at their doors cheap coal, a good railway service, and large cool store-rooms could be erected with a capacity for storing thousands of cases, sufficient to supply our local demands all the year round. In such cool stores the fruit for export could be cooled down before sending it to Sydney, preparatory to loading it on one of the many ocean liners which are now carrying apples to the Old Country, Germany, and America.

Notwithstanding the fact that the day proved to be one of the hottest of the season the growers spent considerable time among the variety rows, some with samples of fruit which they had brought with them for purposes of identification, while others, perhaps for the sake of comparison, and to see how certain varieties were cropping with us.

Peaches came in for their share of inspection, and although some thought that the flavour was not so good as those grown in certain other parts of the State, the fruit disappeared at an alarming rate, which to an unbiassed mind was a sufficient proof that they were greatly appreciated by the majority, and a few in particular who were seen leaving the orchard with bulging pockets and still more bulging pocket-handkerchiefs.

The varieties growing there are good canning and drying varieties as well as being good for dessert, and one would have to travel some distance to see trees so well grown or carrying such crops of good saleable fruit, and I am free to assert that they have not proved themselves the least profitable fruit to grow in that district, as they have carried heavy crops since they were four years old and the fruit has always commanded good prices. These trees I had planted in September of 1897, just a year after the older portion of the apples were planted. The latter trees, however, did not make any headway for the first year, owing to the very dry season.

There were present on the 14th about 175 excursionists who travelled by train, and about 125 who either drove or walked to the orchard on the day in question, and while it was impossible for the officers of the Department to have a personal interview with all of them, still we had the opportunity of a chat with a good many and they all appeared well satisfied with their outing and expressed a desire to come again should similar arrangements be made to visit this or one of the other orchards another year.

During the day refreshments were served in the Cannery and included luncheon and afternoon tea. This gave the visitors a good long day for their inspection of the orchard and farm.

Orchard Notes.

W. J. ALLEN.

APRIL.

Green Manuring.—Although it is getting rather late in a good many districts to sow crops among the trees, it is, however, best to put them in as early as possible now rather than to miss the season. It is a recognised fact that soil cannot go on producing crops without the loss of a great amount of plant food which is required for the sustenance of the trees or vines, and hence it becomes necessary for growers to assist in replacing in as large a measure as possible the constituents so removed from the soil. One of the best and cheapest ways of doing this is the growing and ploughing under of green crops, such as clovers, vetches, peas, &c., which help, not only to build up the worn-out soil, but also assist in keeping it in condition when once it has been put into a suitable state of fertility.

Liming Soil.—Lime may be applied in cases where the soil is found to require it, particularly where it is sour, or where it is very heavy or sticky. After making the application of lime see that it is well worked into the surface soil.

Destruction of Pests.—It is most important that our citrus growers should endeavour to rid their trees of all scales, either by fumigating or spraying, and this with as little delay as possible, as even after the scale is killed it takes some time for it to leave the fruit, particularly after fumigation. Fumigating tables may be obtained on application to the Department of Agriculture.

Planting.—Planting of citrus trees may be continued this month. When autumn planting is practised care should be taken in handling such trees not to expose the roots to either wind or sun for any length of time. As there has been a good demand for suitable varieties of apples for export this year, growers of this fruit should, in planting, only put in such varieties as are found the most suitable for export, and remember that an apple which colours up nicely (preferably red), and which carries and keeps well, is the one to grow; and also bear in mind that the grower who can supply a line of ten thousand cases of any such variety can easily find a buyer for same. Up to the present the trouble has been that exporters could get only a few hundred cases of a kind, and not in sufficiently large quantities to make it worth their while to exploit foreign markets. There is also a good demand for suitable varieties of good carrying grapes for export, and from information which I gathered while in the western part of the United States and Canada, a good market could be found there for considerable fruit during April, May and June. Those who intend planting out new orchards should get the land

cleared and subsoiled as soon as possible, and trees secured. In planting apple-trees see that they are all worked on blight-proof stocks, as trees worked on such stocks can be easily kept free of the woolly aphis.

San José Scale.—In Bulletin No. 107 of the University of Illinois it is claimed, after a series of careful experiments, that the lime and sulphur solution, without the addition of the salt, was the spray which destroyed the largest percentage of scale. The mixture was applied about the time the buds began to swell in the spring and was made as follows:—By taking 15 lb. of best lime and 15 lb. of sulphur to 50 gals. of water. The sulphur was put into 12 gals. of water, nearly at the boiling point, after being mixed with sufficient water to form a thin paste; the lime was then added, and the mixture was then boiled for forty minutes, keeping it stirred from time to time. The whole was then strained into a 50-gallon tank which was thereupon filled with water. If one has a tank large enough to bring the whole 50 gals. to a boil, and apply while hot, I am inclined to think that this spray would be still more effective. Such a solution should not be so hard on the hands of the operator as when salt is added.

Codling Moth.—Bandages must still be kept on the trees, as even after all the fruit is removed, an occasional grub finds its way to the bandages. All props should be removed from the orchard, and any grubs adhering to them destroyed. Directions for mixing arsenite of soda, or more properly, arsenite of lime, have been given in these notes from time to time under the name of arsenite of soda, but when the lime is added to this it is called arsenite of lime, and arsenite of soda should never be used alone as a spray, but should always have lime added, or else the foliage and fruit will be destroyed. Another solution which is coming into favour now is the arsenate of lead, which is claimed to stick and stay in suspension better, and shows on the foliage when used without Bordeaux mixture. It is not likely to burn the foliage as will the other sprays, and requires no boiling or lime, and has only to be diluted in cold water. $2\frac{1}{2}$ lb. of arsenate of lead to 50 gals. of water will be found the proper strength, and the apple-trees should be given a thorough spraying just as soon as most of the petals have fallen, then give two later sprayings at intervals of thirty days. Be careful to cover every part of the tree, and be most careful over the first application to see that it is done thoroughly, and every young fruit covered. The price of this chemical has made the use of it prohibitive (1s. 6d. per lb.), but I believe the firm who handle it most largely are prepared to reduce the price by at least half in order to bring it into more general use.

Practical Vegetable and Flower Growing.

W. S. CAMPBELL.

Directions for the Month of April.

Vegetables.

The following translation of an article on the cultivation of the nettle, published in the *Journal d'Agriculture Pratique*, will, I have no doubt, prove interesting to many readers in the country who have the nettle growing in only too great abundance about their farms.

"The nettle is well-known throughout the world. It is found everywhere —by the wayside, on old walls, in rubbish heaps, &c. It belongs to the *Urtica* family, and contains several species, of which one, the Common Nettle, is particularly interesting from an agricultural point of view. This plant, although despised, might be cultivated with great advantage, either as a textile or as a forage plant, and as the latter it should be of great interest to us, especially this year, when there exists a veritable forage famine. The nettle has quite inestimable advantages.

It is an extremely vigorous plant, as its hardiness and commonness proves. It grows quickly, and in consequence will supply crops at any season of the year, whenever it may be required. The dried plant makes an excellent fodder, and is very nutritious, whilst its culture is quite inexpensive. It has absolutely no drawbacks, unless we admit that it fouls the soil.

It flourishes on the poorest soil, in all kinds of neglected corners, and has hitherto been regarded as worthless, until a year of scarcity like the present brings it into prominence as a fodder plant. The soil should be prepared according to its composition, and seed is sown either broadcast or in furrows, 4 inches apart. The seed, which is extremely fine, should be mixed with sand or ashes before sowing, so as to be spread evenly.

It may be sown at any time from spring to autumn. The seed is lightly covered over either by means of a rake or with a heap of brushwood.

If an immediate production is required (which, this year, would be most important), it would be best to plant now (in September, France) pieces of the roots in rows, from 6 inches to 8 inches apart and about 6 inches deep. The nettle flourishes in all weathers ; it withstands drought and wet weather equally well, and the most intense cold of winter. It grows very quickly, and may be cut when 16 inches high, before it attains its full development— at 60 to 72 inches—when it becomes stringy and hard. If the plants are cut young they should supply several crops every year, and may easily give

50 to 75 tons per hectare ($2\frac{1}{2}$ acres). As everyone knows, the nettle is covered with fine, slightly-curved hairs, which, when entering the skin, break off, and give forth a caustic liquid, which causes much local irritation. It is this property which has prevented its cultivation.

Strange to say, it has no ill-effects either on animals or on the farm labourers. The forage, half-dried, is much liked by cattle, cows and pigs in particular. If cultivated with any care its value should exceed that of clover.

In France and in Sweden the nettle is used, not only as a forage plant, but also as food for human beings, and is much appreciated. It has many therapeutic qualities, and will grow ten to fifteen years on the same soil, without or with very little care and attention.—E. Miège.

Asparagus.—As the soil is likely to be in a workable condition after the heavy rains during last month, a portion of the garden should be prepared for this vegetable, but planting need not be carried out until the end of the winter, or some time during the winter if the gardener desires to get the work over.

Beans, Broad.—April is a good month for the sowing of this vegetable extensively, and it will take the places of varieties of the kidney bean during the winter months. Sow the seed in rows about 3 to 4 feet apart. The drills should be about 3 inches deep, and the seed may be dropped from 4 to 6 inches apart in the drills. Dwarf varieties can be planted much closer than the tall growing varieties. If artificial manures are to be used, try superphosphate of lime and potash. These will be found useful to add to dung.

Beans, French or Kidney.—Sow a few seeds in the warmest districts of the State only.

Beet, Red and Silver.—A sowing or two may be made during the month if any more plants are required. Young red beets now well above ground had better be well thinned out. Silver beets can be transplanted when large enough. Very few of these are likely to be required by an ordinary-sized family.

Borecole or Kale (originally *Kail*).—As this is a good winter vegetable and likely to be improved by a touch of frost, a little seed may be sown. Try the dwarf green-curled variety, for it is a good one, and if grown well is tender and sweet.

Brussels Sprouts.—An admirable vegetable and one that succeeds best in the cool climates of the State. The very best seed possible to procure should be obtained. This vegetable, like all the members of the cabbage family, needs abundance of good manure. Rotten dung that has not had its most valuable constituents washed out by rains is the best to use. The soil should be dug deep and the manure well mixed with it.

Cabbage.—This is a very good time to sow extensively of this vegetable. Plant out well advanced seedlings that had been pricked out, and prick out a few from seed bed.

The cabbage shown in the illustration was named the Extra Improved Early Summer Cabbage, but its name has been altered to Defiance Short Stemmed.

It was tried by Mr. Ellis, Superintendent of the Viticultural Station, Howlong, and he reported it as being the best cabbage he ever grew, even better than Phenomenal. He describes it as rather low-growing and broad, and its texture and flavour as being everything that could be desired.

Short Stemmed Cabbage.

Cauliflower.—Sow a little seed during the month. Prick out seedlings, and plant out advanced pricked-out plants. It is worth while taking a good deal of care in planting out cauliflowers, for much depends on their being moved so well that the growth is not checked. Water the young cauliflowers

well before removal, and water after they are planted. Use abundance of well-rotted manure, work the ground well and deep before planting, and during the growth of the plants keep the surface soil in a friable condition by frequently working it.

Carrot.—Sow two or three times during the months as extensively as may be required.

Celery.—Plant out, from time to time, a few well-grown seedlings. If the seedlings have grown large, remove several of their leaves and cut back their roots when planting out. Use abundance of manure, and water freely.

Endive.—A useful salad plant for winter use. Resembles the lettuce very much, but more bitter in flavour. Sow a little seed from time to time. This is a good time to plant out seedlings.

Leek.—Seed may be sown occasionally in small quantity during the month, and young leeks may be planted out in shallow trenches as they are large enough to handle, that is, when they have grown to a height of 6 or 8 inches or so. The soil must be made very rich if good samples of leeks are required.

Lettuce.—Sow as extensively as may be required during the month. Plant out seedlings as often as it may be necessary to keep up a continuous supply. Transplant with care to prevent their roots being broken more than can be avoided. Use abundance of rich, well-rotted manure.

Onion.—Seeds may be sown largely during the month. Manure the ground heavily, and mix the manure well with the soil. Make the surface soil as fine as possible. Make it level when digging, and be particularly careful to let it be well drained. Sow seed in drills, and do not cover it deep with soil; just sprinkling the soil over it should be sufficient.

Parsley.—Sow a little seed, if plants are required. The garden should never be without some plants, for this is a very useful herb, and always in demand.

Parsnip.—This vegetable requires the soil to be dug deep, it being a very deep-rooting plant. Sow a few drills during the month.

Peas.—Sow largely in rows from time to time during the month. Stick the seedlings, when 2 or 3 inches in height, in order that the plants may start to climb as soon as possible.

Try a row or two of the edible podded pea, which may be used pod and all, and is a very excellent vegetable.

Radish.—Sow occasionally during the month, to keep a supply going. Very little space will be needed.

Shallots and Garlic.—Plant out a few bulbs in rows, setting them about one foot apart in the rows. Very little garlic need be planted, for it is not required much, as a rule, in the kitchen.

Herbs.—Seeds may be sown this month of any kinds that may be required. Herbs are of great value for domestic purposes, and are nearly always needed.

Flowers.

Plant out as soon as possible all sorts of spring flowering bulbs such as daffodils, watsonias, hyacinths, tulips, sparaxis, anemones, ranunculuses, crocuses, snowflakes.

The autumn is a favourable part of the year for beginning the work of flower gardening, and anyone who may happen to read these notes, and who may have any unoccupied land, is urged to make a commencement. Flower seeds are cheap, and at a cost of a few shillings a very pretty flower garden could be made ; and now is the time to sow all sorts of hardy annuals of all sorts. It is a good time also to sow biennials and perennials, that is, those plants which will live for two years or more, and those which live for many years. The annuals, as a rule, live for one season only. They grow, produce their flowers, ripen their seeds, and then die away.

This is a good time of the year to plant evergreens of all kinds, and also for the propagating of plants from cuttings, and those who desire to increase their stock of roses from cuttings should take advantage of the best month of the year for this purpose.

Roses, dahlias, chrysanthemums of early varieties, carnations of the perpetual or tree varieties, bouvardias, and many other plants should be flowering splendidly during April, or the greater part of it.

Farm Notes.

Hawkesbury District—April.

H. W. POTTS.

Summer departs with April. The early signs of autumn are evidenced on all sides. The leaves on the trees are changing colour. Summer crops are being rapidly fed off. The longed-for genial rains have arrived, and the drought may be considered broken. Over 4 inches of rain fell last month, and supply the conditions for an early germination of the winter crop. So far the subsoils remain dry, but these may moisten later on.

There is a fresh autumn growth, and grass and the stock are doing well.

One marked feature is very prominent in connection with *Paspalum dilatatum.* During the summer up to last month it suffered keenly, and looked a hopeless fodder. The response, however, to the recent rains is remarkable. The rapidity and succulence of the growth is highly satisfactory.

The lucerne paddocks are looking well, and will provide a heavy cut before the advent of frosts.

The late sown crops of maizes, sorghums, and millets have reached the stage when cultivation may be suspended. Heavy forage crops are already assured from these before the cold weather arrives. This month should prove a very heavy one with the farmer. Every opportunity should be seized to get in the main crops whilst warmth and moisture are present.

Owing to the shortage in our hay crops last spring it is imperative that provision be made this season for abundant supplies of green stuff for winter use as well as for hay next season.

As a crop for hay the Algerian oat has invariably afforded the best results in this district. Other sorts do well in giving heavy yields, but the drawback to them is rust. When sown early the Algerian resists rust. Where the land is fairly rich, or has been well manured, the seed may be sown more thickly in order to secure a fine straw. This sort may be sown. Where it is possible the addition of tares, half a bushel to the acre, will improve the crop as a fodder to be fed green to stock. In some paddocks it is found that the Grey field-pea provides a good substitute for tares. They may also be grown as a crop alone to advantage. Skinless oats may also be sown as a quickly-maturing crop.

Barley.—Skinless or Cape varieties are useful for green fodder, and may be now sown, especially with tares or peas.

The Kinver and Golden Grain sorts have proved payable as grain crops. Where soils are light, open, and friable they should be rendered rich by the addition of superphosphate.

Wheats.—The main crops for wheaten hay may be sown this month—White Lammas, Blounts' Lambrigg, Nonpareil, Australian Talavera, Thew, Nut Cut, and Bobs. Amongst the bearded varieties Medeah and Beloturka are the best.

Rye.—Emerald and Thousand Fold for green crops are best sown on the poorer soils. They are hardy, and will stand winter conditions well. Rye acts as a good catch crop, particularly if we have a wet winter, seeing it checks the ill-effects of leaching, and is not so exhaustive. It may be used also for green manuring.

Turnips and Swedes.—These useful root-crops should not be overlooked. They always provide excellent fodder for sheep, pigs, or cattle, and serve a good purpose in the rotation of crops. Should the market rates prove favourable, then the best can be sold. The best roots are Sutton's Magnum Bonum, White Pomeranian, Purple-top Aberdeen, Green-top Aberdeen, and Purple-top Swede. The season is promising for these crops.

Rape.—Further sowings of this profitable fodder-plant should be made. Few fodders so readily adapt itself to different soils and conditions as rape. It is palatable, nutritious, and responds vigorously to good cultivation and fertilisers. It will stand heavy frosts, and is always handy for stock in winter for grazing purposes. For foul or dirty land, no crop cleanses it more effectively, and it is an excellent means of fertilising land for heavy summer crops such as maize.

Clovers.—The best sort to sow is the White Dutch perennial white clover (*Trifolium repens perenne*). Our trying summers effectually destroy other varieties. With the White Dutch sort, our experience has been satisfactory, in so far that with the return of moist conditions it springs up with renewed vigour and spreads rapidly. In the spring it provides an excellent adjunct to all classes of pasturage. The deep tap root survives all drought. It thrives on poor soils, and may be classed amongst the sturdiest and most vigorous of clovers. One pound of seed to the acre is sufficient to establish a permanent growth with other grasses.

Carrots and Parsnips.—Both for market purposes as well as stock feed, these valuable root-crops should receive attention.

Lucerne.—The main sowings of this most profitable of all fodders should be taken in hand this month. The light loamy soils of this district, as well as the heavier alluvial soils of the Hawkesbury Lowlands, can be utilised with the most satisfactory results for the growth of lucerne. The dry season has retarded the growth, but the recent rains brought the plant into full development in a surprising manner. The soil should be well worked by ploughing, rolling, and harrowing. A fine tilth and surface seed-bed is required. The subsoil should be firm and close. Rapid germination is required to ensure the young plant becoming well developed and sturdy before the frosts set in. Many farmers adopt the practice of sowing lucerne with a nurse crop for grain or hay. This, however, is not considered a safe method; it interferes with the even growth of the lucerne. The quantity of seed per acre to sow is often determined by the character of the soil. From 10 lb. to 15 lb

to the acre. On some classes of land, a good stand has been secured by as low as 6 lb. to the acre. Broad-casting is the system generally adopted, as drilling has a tendency to sow the seed too deeply. An all-important factor in successful results is the purity and high vital power of the seed. Clean seed, of good germinating quality, should be procured, as so much seed is mixed with dodder, unless purchased from a reliable source. It should be bright, clear colour, clean and new. Seed should not be buried more than 2 inches. In many light soils, rolling after sowing is sufficient, and will bury the seed deep enough. In most cases, a covering of half an inch of soil is ample. Should the soil require fertilising, the most suitable mixture is $1\frac{1}{2}$ cwt. superphosphate and $\frac{3}{4}$ cwt. sulphate of potash to the acre. In all cases, it must be remembered that land set apart for lucerne growing must be well drained.

Clarence River District—April.

T. WALDEN HANMER.

The summer season, now drawing to a close, has been somewhat remarkable for its comparative coolness, and for the bountiful rainfall, and maize crops have, in most places, grown an extra amount of stalk, though at the same time they promise to yield well. Herbage of all kinds, too, has made most prolific growth, and overrun cultivation to such an extent that it has been more than most farmers could do to keep it in check.

In the Farm Notes of May, last year, the writer made mention of several varieties of wheat that were to be tried at the Grafton Experimental Farm, and hoped to publish particulars in the *Gazette*. Unfortunately, before they could be harvested a storm of cyclonic severity visited the farm on October 16, and all that was left, when the storm had spent its fury, was a tangled mass of straw. However, only one out of six varieties showed any sign of rust, and that was Velvet Dun. The variety named Medeah, which had been tried the previous season, proved itself suitable again and attained a height of 6 feet 6 inches. We are going to try them again this season and also John Brown and Bobs, and, we trust, with better luck. Of several varieties of oats tried last season only Algerian proved to be rust-resisting.

Skinless barley and Canary seed were also tried and were very successful up to the time of the storm.

Wheats.—April is a good month to sow wheats, and we are to try the following varieties this season:—Medeah, F. R., Kubanka, Farrer's Durum, Cretan, John Brown, and Bobs. We hope to secure grain off part of the areas sown, so as to test the yield in this district, though it is years since wheat was grown to any extent for grain. We do not consider that there is any doubt about most of these varieties for green feed and hay.

Oats.—Algerian, Tartarian (black and white), Abundance, Great Northern, Ligomo, and Red rust-resisting will be planted again this season.

Barley.—Skinless, Cape, and English will be sown.

Rye.—Emerald and White Rye will be tried in small areas, although as green fodder for milking cows we do not entertain a very high opinion of them.

Canary Seed will, too, occupy our attention in a small area; there is, of course, a good demand for the seed.

All of these cereals will be sown with a Hoosier seed drill.

Lucerne.—This month is a good one for sowing this excellent fodder plant, provided, of course, that the land is in proper order. We are always advocating its use and anyone visiting this farm can easily see that we practise what we preach, and each year lately we have added a small area. This autumn we hope to lay down another 10 acres with lucerne.

Red Clover.—This is a crop that from our experience in "other parts" we know is very valuable and much relished by stock of all classes, and we hope to prove its value here. It should be sown at the rate of about 20 lb. per acre broadcast.

Essex Rape.—7 lb. of this seed will be sufficient for an acre, sown broadcast. It is an excellent green crop and also makes a good green manure.

Italian Rye Grass.—This is only a biennial, but yields three or four heavy crops in a year, and makes the very best of hay for horses, especially in fast work; it should be sown at the rate of 2 bushels per acre.

Tares or Vetches.—Make excellent fodder and green manure. They may be sown by themselves broadcast at the rate of 1 bushel to the acre, or barley or oats may be mixed with them and sown at the rate of half a bushel. This is the usual method of sowing in the Old Country, and the barley or oats keeps the vetches off the ground.

Grass Seeds.—The autumn is the best time of year for sowing grass seeds of all kinds.

Green Fodder for Milking Cows.—We have excellent crops of Early Amber Cane, or Planters' Friend, and smaller areas of Penicillaria, or Pearl Millet, and Teosinte.

The Early Amber Cane and Planters' Friend are too well known to write of, but we might say something of Penicillaria and Teosinte.

Penicillaria with us this year has grown to an enormous height; some stalks are over 16 feet. We are not much in favour of it, however, and neither do the cattle seem to relish it to any extent, as it is rather coarse and fibrous. However, it is a good thing to have as a "stand by."

Teosinte is absolutely a new thing, and a good thing up this way. The Farm is the only place that it can be seen at. We have some stalks fully 15 feet high, and up to 80 shoots have been counted as the growth from one small seed. This, of course, has not been cut, but an area of about ½ an acre has been cut once when about 3 to 4 feet high and given to the cows, who appeared to relish it very much. It is now shooting up again well, and we expect to get two more cuttings before the frosts; as it is a tropical plant it is no use for winter cow feed.

April is a good month to plant out evergreen fruit trees, and also strawberries.

In the kitchen garden this month sow peas, broad beans, cabbage, lettuce, beet, turnips, parsnips, carrots, &c.

Glen Innes District—April.

R. H. GENNYS.

Wheat.—The end of the month is a good time to sow wheat here, especially sorts that take a long time to mature—such as the Manitobas.

Barley, Rye, &c., may be sown for green fodder. Cape and Skinless are two good sorts. Sow the latter thickly, as it is a poor stooler.

Lucerne may also be sown, although it is getting late.

Any land not ready for crops should be dealt with at once.

Sow onions towards the end of the month, also cabbages and cauliflowers.

Tares, vetches, &c., may be sown in combination with rye or barley. The former are good for ploughing in in orchards during the winter months.

Artificial Manures.

The subject of manuring land must largely engage the attention of our farmers in the near future, as it is evident much soil is being depleted rapidly of plant-food essential to our principal crops.

When farm-yard manures are not obtainable there is no doubt of the value of artificial manures when intelligently applied, but putting them in irrespective of the nature of the soil—whether the land has been cropped for a number of years, or new land, and applying much more than a sufficient quantity of what the crop intended to be grown requires—is a mistake, and must eventually end in loss.

Ill-drained lands and soils in bad mechanical condition cannot be expected to benefit much by the application of manures. Soil must have proper treatment: it must be ploughed deeply at least once in the year, and the top brought into a fine state of tilth. It must be drained when necessary. It should be *limed some time before* in sour land and in heavy clay. Some soils require green crops ploughed in to supply humus. It is pointed out that the growth of a plant is determined by supplies of essential food readily available that is soluble, for they are only taken up and used by plants in this way. Generally speaking, farmers want the result on the crop the manures are sown with, and this is where superphosphates for wheat and sulphate of potash for potatoes come in. If manures not easily soluble are applied, then the preceding crop should be manured, in order to benefit the succeeding one.

Before attempting to manure, a farmer should either find out for himself, by small experiments, what essential plant-food his soil is deficient in, or send samples of the surface soil and subsoil to the Chemist, Agricultural Department, for analysis.

Nitrogenous ingredients can generally be done without, as nitrogen can be more cheaply conserved by growing leguminous crops and ploughing them in.

Manures for grain are much more efficiently applied by the drill than by being broadcasted. Manure the crop, and not the land. Apply what is ample for the former requirements, and no more, for artificial manures are expensive.

Riverina District—April.

G. M. McKEOWN.

Wheat.—The recent rainfall has made possible the preparation of large areas of land which until a few days ago has been too hard for ploughing. The work of preparing land should therefore be pushed forward without delay, so as to ensure early sowing of cereals. March is one of the best months for sowing for hay, but conditions are favourable to the end of April. The heaviest crops and the most palatable and nutritious hay have been obtained on the farm from white wheats, such as Zealand, White Essex, Australian Talavera, and White Lammas. Marshall's No. 3 is the best of the Purple Straws, as most of the others have straw which is of light weight, and all are liable to bear a good deal of dead flag. In all cases fertilisers should be used, and it is preferable that they be drilled in with the seed, the latter being sown at the rate of 45 lb. per acre. During the month sowing for grain crops should be commenced, but all such work should be completed by the end of May, as late sowing has been proved unprofitable. The most successful variety during eight years' systematic trials has proved to be Farmers' Friend, with Hudson's Early Purple Straw next during six years. For five seasons Federation has been slightly in the lead.

Barley.—Should be sown for green fodder without delay, and for grain production sowing should be completed by the middle of May. For green fodder sow the Skinless or awnless variety, as bearded cereals should not be used in any form as fodder for stock. For greenstuff sow ¾ bushel of seed to the acre. For grain crops sow 25 lb. to 30 lb. of seed with the drill. In all cases fertilisers should be used, 60 lb. superphosphate and 28 lb. sulphate of potash having given the best results hitherto. For malting purposes Kinver Chevalier has given the best average yield for a number of years, the crop in all seasons proving a payable one.

Rape.—Should be sown without delay in well prepared land, in which superphosphate has first been sown with the drill at the rate of about 80 lb. per acre. Dwarf Essex is the best variety. Seed is best sown broadcast, at the rate of 3 lb. per acre. After drilling in the manure the land should be made even for the reception of the seed, which may be covered by rolling or very lightly harrowing.

Crown Lands of New South Wales.

The following areas will be available for selection on and after the dates mentioned:—

For Conditional Purchase Lease.—(Available under Section 10 of Act of 1905. Regulations 356 to 365. Applications to be made on Form No. 114).

C. P. L. No.	Name of Land District	Holding.	Total Area.	No. of Blocks.	Area of Blocks.	Distance in Miles from nearest Railway Station or Town.	Annual Rental per Block.	Date available.
			acres.		acres.		£ s. d.	1907.
65	Wyalong ..	Upper Wyalong.	26,737	12	1,499 to 3,276	Wyalong Town and Railway Station, 10 to 18 miles.	33 6 0 to 61 8 6	25 April.

Level and undulating country, a small portion hilly; granite and slate formation, red sandy and clay soil; stony on ridges; a large proportion suitable for cultivation; timber—chiefly box, pine, oak, gum, currawong, ironbark, a little wattle and mallee scrub; partly ringbarked, but mostly overgrown. No natural water supply, but good facilities exist for conserving by tanks and dams.

For Original Settlement Lease Only.—(Available under Section 25 of Act of 1895. Regulations 148 to 157D. Applications to be made on Form No. 50).

S.L. No.	Name of Land District.	Total Area.	No. of Farms.	Area of Farms.	Distance in Miles from nearest Railway Station or Town.	Annual Rental per Block.	Date available.
		acres.		acres.		£ s. d.	1907.
853	Inverell ..	16,036	6	2,163 to 3,812	Warialda, 14 to 16 miles; Inverell, 25½ to 29 miles; Reedy Creek Railway Siding, 4 to 13 miles. Bingara, 14 to 16 miles.	27 4 8 to 58 11 8	18 April

Varying from undulating and hilly to mountainous; volcanic formation; soil varies from rich black, stony in places, to light grey granite soil, the country consists of partly thick forest timbered with gum and ironbark, partly open forest timbered with box and ironbark, partly fine wattle and ti-tree scrub; a small proportion suitable for cultivation, remainder suitable for grazing only. Water supply good and fairly permanent.

852	Tenterfield	....	1	2,925	Tenterfield, 18 miles..	36 11 4	18 April

Undulating to high, steep, and rough mountainous country of granite formation, and altered slate formation; generally sandy loam and stony soil; timbered with gum, box, apple, ironbark, stringybark, oak, and peppermint. There are no rabbits, and marsupials and other noxious animals are kept in check by trappers and shooters. Present carrying capacity, 1 sheep to 2½ acres; when improved at a cost of about 3s. 9d. per acre on the parts operated upon, 1 sheep to 2 acres. Water Supply—Probably sufficient in the Mole River and various creeks. Rainfall, 31·28 inches at Tenterfield.

855	Tenterfield ..	....	1	2,700 (about)	Stanthorpe (Queensland) Railway township, about 15 miles; Tenterfield (New South Wales) about 25 miles	22 10 0	18 April

Undulating tableland and steep falls, country of granite formation; soil, loamy and sandy on clay and cement subsoil; timber—stringybark, blackbutt, honeysuckle, oak, box, gum, apple, and peppermint mostly open forest; about 1,000 acres of hop bush scrub (edible). Not suitable for agriculture, but sound grazing country, adapted for breeding and fattening all classes of stock except sheep. Present carrying capacity, one beast to 20 acres. Improveable by the destruction of timber, and fencing at an average cost of about 6s. 9d. per acre to one beast to 12 acres. The mean annual rainfall at Tenterfield is 33·58 inches. Ample and permanent water in Bookookoorara Creek.

For Original Homestead Selection Only.—(Available under Section 14 of Act of 1895. Regulations 49 to 58A. Applications to be made on Form No. 7).

H.S. No.	Name of Land District.	Total Area.	No. of Blocks.	Area of Block.	Distance in Miles from nearest Railway Station or Town.	Annual Rental per Block.	Date available.
				acres.		£ s. d.	1907.
826	Gosford ..	....	1	208	Ourimbah, 2 to 2½ miles; Gosford, 4 to 7 miles.	2 12 0	18 April

Sandstone formation; generally speaking, rough broken ridges, more or less stony, with patches of good brush land; suitable in parts for agriculture; soil is principally a grey clay, but varies from poor, light, sandy soil to a rich heavy clay; timbered with gum, mahogany, blackbutt, ironbark, turpentine, oak, brushwood. No permanent water.

For Original Conditional Purchase Only.—(Classified under Subsection 1 (a), Section 4, of Crown Lands Amendment Act, 1905.) Available under Section 26 of Act of 1884. Regulations 74 to 130. Application and declaration to be made on Forms 21 and 22.

Name of Land District.	Name of Holding, &c.	Parish.	County.	Total Area.	Price per Acre.	Date available.
				a. r. p.	£ s. d.	1907.
Armidale* ..	Guyra Suburban Lands.	Falconer	Sandon ..	73 0 20	3 0 0 and 3 10 0	2 May.
	Being portions 255 to 259; residential areas; suitable for orchards, &c.					
Carcoar* .	Barry Suburban Lands.	Neville .. .	Bathurst .	15 2 25	4 0 0	23 May.
	Being portions 204 and 401; residential areas; suitable for cultivation.					
Glen Innes ..	....	Blair Hill	Gough ..	40 0 0	1 0 0	11 April
	Being portion 68; suitable for grazing.					
Goulburn ..	....	Tyrl Tyrl .. .	Georgiana and Argyle.	77 3 0	1 0 0	9 May.
	Being portions 125 and 164; suitable for grazing.					
Mudgee* ..	Gulgong Population Area.	Gulgong . ..	Phillip .	76 3 0	4 0 0	23 May.
	Being portions 359 and 360; residential areas; suitable for cultivation.					
Murwillumbah ..	....	Kynnumboon .	Rous ..	189 1 0	2 0 0	16 May.
	Being portions 32, 52, and 53; suitable for grazing, dairying, &c.					

* Identical with Special Area, see page 399.

For Original Conditional Purchase and Conditional Lease in virtue thereof.—(Classified under Subsection 1 (b), Section 4, of Crown Lands Amendment Act of 1905); available under Sections 26 and 48 of Act of 1884. Regulations 74 to 130. Application and declaration for Original Conditional Purchase to be made on Forms 21 and 22, and for Conditional Lease on Forms 95 and 96.

Name of Land District.	Name of Holding, &c.	Parish.	County.	Total Area.	Price per Acre.	Date available.
				a. r. p.	£ s. d.	1907.
Bathurst .	....	Lowry .. .	Bathurst .	660 0 0	0 11 8	18 April
	Suitable for grazing.					
Cooma .. .	....	Bunyan .. .	Beresford .	124 2 0	3 0 0	2 May
	Being portion 183; suitable for grazing and agriculture.					
Cooma	....	Cooma	Beresford .	221 3 0	2 5 0	2 May
	Being portion 286; suitable for grazing and agriculture.					
Coonabarrabran.	....	Bandulla . ..	Gowen .	920 0 0	1 3 4	11 April
	On Piangula Creek; suitable for grazing.					
Glen Innes ..	....	Boyd, Bloxsome, and Severn.	Gough ..	520 0 0	0 16 8	2 May
	Suitable for grazing.					
Glen Innes ..	Glen Elgin, and Merven, and Ranger's Valley.	Eastern Water, Lewis, Garrett, and Bald Nob.	Clive and Gough.	12,500 0 0	0 15 0	18 April
	Suitable for grazing.					
Gosford	....	Tuggarah .. .	Northumberland.	208 0 0	1 0 0	18 April
	Being portion 113; suitable for fruit-growing. (Also set apart for Original Homestead Selection.)					
Goulburn ..	....	Belmore . ..	Georgiana ..	384 0 0	0 6 8	11 April
	Being portions 211 and 261; suitable for grazing.					
Lismore	....	Terania	Rous	190 2 0	2 0 0	18 April
	Being portion 73; suitable for grazing and agriculture.					
Mudgee	....	Waurdong	Wellington ..	740 0 0	0 13 4	16 May
	Suitable for grazing.					
Mudgee and Wellington.	....	Waurdong and Tatuali.	Wellington ..	11,300 0 0	0 13 4	16 May
	Suitable for grazing.					
Murwillumbah ..	....	Condong .. .	Rous .. .	470 0 0	1 0 0	16 May
	Suitable for grazing.					
Murwillumbah ..	....	Burrell	Rous	200 0 0	2 10 0	23 May
	On Pumpenbill Creek; suitable for grazing, dairying, &c.					

FOR ORIGINAL CONDITIONAL PURCHASE AND CONDITIONAL LEASE IN VIRTUE THEREOF—*continued.*

Name of Land District.	Name of Holding, &c.	Parish.	County.	Total Area.	Price per Acre.	Date available.
				a. r. p.	£ s. d.	1907.
Newcastle ..	....	Coorumbung .	Northumberland.	488 0 0	1 0 0	9 May
On Gigadee, Merchants, and Grassy Creeks; suitable for grazing, fruit-growing, &c.						
Queanbeyan ..	....	Bullengong. .	Murray .	200 0 0	1 5 0	23 May
Being portions 66 and 67; suitable for grazing and agriculture.						
Tenterfield .	....	Gibraltar . ..	Clive.. ..	1,280 0 0	0 16 8	11 April
Suitable for grazing.						

CONDITIONAL PURCHASE (ORIGINAL OR ADDITIONAL) OR CONDITIONAL LEASE.—(Available by revocation of reserves, and not classified or specially set apart under Section 4 of the Crown Lands Amendment Act of 1905.) Available under Sections 26, 42, and 48 of Act of 1884. Regulations 74 to 130. Application and declaration for Original Conditional Purchase to be made on Forms 21 and 22, and for Additional Conditional Purchase or Conditional Lease on Forms 95 and 96.

Name of Land District.	Name of Holding, &c.	Parish.	County.	Total Area.	Price per Acre.	Date available.
				a. r. p.	£ s. d.	1907.
Muswellbrook ..	....	Denman ..	Brisbane .	80 0 0	1 0 0	2 May
Being portion 107; formerly railway reserve 12,142.						

CONDITIONAL PURCHASE AS SPECIAL AREA.

Armidale Land District, within Guyra Suburban Lands, 73 acres 0 roods 20 perches, maximum area 20 acres, minimum area 8 acres 0 roods 10 perches, being portions 255 to 259, parish of Falconer, county of Sandon; residential areas, suitable for orchards, &c.; price £3 and £3 10s. per acre. Available for original applications only on 2nd May, 1907.

Carcoar Land District, within Barry Suburban Lands, 15 acres 2 roods 25 perches, maximum area 7 acres 3 roods 15 perches, minimum area 7 acres 3 roods 10 perches, being portions 204 and 401, parish of Neville, county of Bathurst; residential areas, suitable for cultivation; price £4 per acre. Available for original applications only on 23rd May, 1907.

Mudgee Land District, within Gulgong Population Area, 76¾ acres, maximum area 40½ acres, minimum area 36¼ acres, being portions 359 and 360, parish of Gulgong, county of Phillip; residential areas, suitable for cultivation; price £4 per acre. Available for original applications only on 23rd May, 1907.

FOR IMPROVEMENT LEASE—(Available under Section 26 of Act of 1895. Regulations 157E to 160 and 250 to 262A. If not tendered for within time advertised may be subsequently applied for on Form 91).

Block Numbers.	Land District or Place of Sale.	Name of Holding.	Total Area.	No. of Blocks.	Area of Blocks.	Upset Annual Rental per Block.	Date of Sale or Tender
			acres.		acres.	£ s. d.	
431, 485, 258, 259, 438 to 455, and 1,441	Condobolin	Melrose and Palisthon	86,920	21	860 to 8,000.	0 13 4 to 10 3 2 (The latter including rent for use of Crown improvements.)	Sale, 15th April, 1907.
Principally level country; generally loose red sandy soil with clay subsoil; mostly covered with dense mallee scrub (whipstick) and spinifex, but part timbered with box, pine, and yarran, and covered with scrub, mostly mallee, with goona, sifting-bush, pine, wattle, and warrior-bush. No natural water supply, but could be conserved in tanks. Infested with rabbits, wallabies, and dingoes. Rainfall about 17 inches per annum.							
1,453 to 1,455	Deniliquin	Moira	5,400	3	1,400 to 2,300	23 6 8 to 38 6 8	Sale, 15th April, 1907.
Country all more or less subject to flood; principally light-coloured clayey soil, mixed with sand, also a little grey clayey loam; timbered with gum, mostly thinned out and partly ringed, picked up and burnt off, with dense seedlings in places; also a little box timber and box suckers and seedlings. Permanent water in the Murray River, which the block fronts. Rabbits exist. Situation—on the Murray River, about 4 miles from Moama.							

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Sub-Editor not later than the 21st of the month previous to issue.

1907.

Society.	Secretary.	Date.
Yass P. and A. Association	W. Thomson ...	April 9, 10
Orange A. and P. Association	W. Tanner ..	,, 10, 11, 12
West Maitland H., R., A., and H. Association ...	C. J. H. King ...	,, 10 to 13
Bathurst A., H., and P. Association	W. G. Thompson	,, 17, 18, 19
Bellinger River Agricultural Association	G. O. Hammond..	,, 17, 18, 19
Wellington P., A., and H. Society	A. E. Rotton ...	,, 23, 24, 25
Cooma P. and A. Association	C. J. Walmsley ...	,, 24, 25
Durham A. and H. Association (Dungog)	C. E. Grant ...	,, 24, 25
Richmond River A., H., and P. Society (Casino) ...	E. J. Robinson ..	,, 24, 25
Macleay A., H., and I. Association, Kempsey ...	Ernest Weeks . .	,, 24, 25, 26
Clarence P. and H. Society, Grafton	T. T. Bawden ...	May 1, 2
Dubbo P., A., and H. Association	F. Weston ...	,, 1, 2
Lower Clarence A. Society	G. Davis... ...	,, 7, 8
Coonamble P. and A. Association	J. M. Rees ...	,, 8, 9
Hawkesbury District Agricultural Association ...	C. S. Guest ...	,, 9, 10, 11
Molong P. and A. Association	C. J. V. Leathem	,, 15
Walgett P. and A. Association...	Thomas Clarke ...	,, 15, 16
Central Australian P. and A. Association (Bourke)...	G. W. Tull ...	,, 22, 23
New South Wales Sheepbreeders' Association ...	A. H. Prince ...	June 24 to 27
Hay P. and H. Association	C. S. Camden ...	July 24, 25
Condobolin P. and A. Association	W. Maitland ...	,, 30, 31
Forbes P., A., and H. Association	N. A. Read ...	Aug. 7, 8
Narrandera P. and A. Association	W. T. Lynch ...	,, 7, 8
Gunnedah P., A., and H. Association	M. C. Tweedie ...	,, 13, 14, 15
National A. and I. Association of Queensland ...	C. A. Arvier ...	,, 13 to 17
Parkes P., A., and H. Association	G. W. Seaborne...	,, 14, 15
Murrumbidgee P. and A. (Wagga Wagga)	A. F. D. White ...	,, 21, 22, 23
Northern Agricultural Association (Singleton) ..	C. Poppenhagen ..	,, 21, 22, 23
Grenfell P., A., and H. Association	Geo. Cousins ...	,, 27, 28
Junee P. A. and I. Association...	T. C. Humphrys ..	Sept. 4, 5
Albury and Border P., A., and H. Society	W. J. Johnson ...	,, 10, 11, 12
Young P. and A. Association	G. S. Whiteman ..	,, 11, 12, 13
Cootamundra A., P., H., and I. Association ...	T. Williams ...	,, 17, 18
Cowra P., A., and H. Association	E. A. Field ...	,, 18, 19
Wyalong District P., A., H., and I. Association ...	S. G. Isaacs ...	Oct. 1, 2

1908.

Albion Park A., H., and I. Society	W. C. Dunster ...	Jan. 15, 16

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Agricultural Gazette of New South Wales.

Forestry.

SOME PRACTICAL NOTES ON FORESTRY SUITABLE FOR NEW SOUTH WALES.

[Continued from page 314.]

J. H. MAIDEN,
Government Botanist and Director of the Botanical Gardens, Sydney.

XVII—*continued.*

Conifers.

II.

TAXACEÆ.

Tribe—SALISBURINEÆ.

1. Ginkgo, L.

(1.) *G. biloba,* L. (*Salisburia adiantifolia,* Sm.) The "Maiden-hair tree."

A remarkably beautiful tree for cold situations, and very easy of culture. One of the few deciduous Taxaceæ. Height, usually 20–30 feet, but may attain a much larger size. It should be in every collection. There is a good specimen in the Botanic Gardens, Sydney, which fruits abundantly every year, but it does not attain its full development there. The leaves and venation resemble those of huge maiden-hair fern leaves, except in size; the fruit, hardly so pointed as figured in Veitch, is an inch long and more, almost orange-coloured, with a "bloom," the flesh acrid or rancid smelling, while the seeds are stated to be eaten in Japan. For a note on the uses of the fruit of the Ginkgo, *see* "The Garden," 11th May, 1901, p. 341.

Those who desire to know more about this interesting tree may refer to "A Chapter in the History of the Coniferæ (Ginkgo)," *Nature,* xxiii, 251.

It is propagated readily from cuttings.

M 30, L 6 c, 15 b, 26* (Sydney Botanic Gardens).

2. Cephalotaxus, Sieb. and Zucc.

Closely allied botanically to Ginkgo.

"The fruits of both genera are destitute of an aril, its place being taken by the testa of the seed, which becomes succulent. The seed or nut, which is enclosed in a hard ligneous shell, is covered with a brown membrane, the lower half of which is adherent to the shell. There is also a well-marked

* These numbers refer to the "Guide (with plan) to the Sydney Botanic Gardens," 8vo., pp. 108; price 6d., postage 2d. extra.

pollen chamber in the nucellus of the seed."*—(Veitch's *Manual of Coniferæ*, 2nd edition, p. 111.)

The genus comes from China, Japan, and the Himalayas.

(1.) *C. Fortunei*, Hooker. See *Bot. Mag.*, t. 4499.

A shrub or small tree, with beautiful foliage, reminding most Australians of that of a Burrawang (*Macrozamia*), though the leaflets of the former are smaller. Sydney is too warm for its full development. It is the strongest growing of the genus in Sydney. It will do better in cold climates.

M 25, L 33 (Sydney Botanic Gardens).

(2.) *C. drupacea*, Sieb. and Zucc.

This is a native of Japan, and a low bush or small tree. It will succeed in many parts of New South Wales.

L 34 d, M 25 (Sydney Botanic Gardens).

3. **Torreya**, Arnott (Tumion, Rafinesque, of some American authors).

The bruised foliage of Torreyas emits a fœtid odour, which has led to their being called "Stinking Yew."

A very handsome genus, of coarse foliage, reminding one of the true Yew.

(1.) *T. californica*, Torrey. "The Californian Nutmeg."

See Sargent, t. 513. Also *Gardener's Chronicle*, 22nd June, 1889.

Leaves nearly flat, green below, elongated. Fruit green, slightly tinged with purple. (Sargent.)

A large tree, which does best in moderately cool, well-watered localities. It does fairly well in the Sydney district.

It is a native of Californian mountain districts at a moderate elevation.

(2.) *T. nucifera*, Sieb. and Zucc. The "Japanese Nut Tree."

The kernels of the seeds yield oil, which is used for culinary purposes in Japan, but the kernel is too astringent to be eaten.

A handsome, dense-foliaged, small tree.

It is a native of southern Jápan.

It does very well in the Sydney district, and, bearing in mind its native home, it will probably flourish in colder places.

U 6 (Sydney Botanic Gardens).

(3.) *T. grandis*, Fortune. The "Kaya" of China.

A strong-growing, tall bushy shrub of 15 feet in Sydney; if trimmed to a single stem, and in good soil, it would doubtless form a fair-sized tree.

M 21 (Sydney Botanic Gardens).

(4.) *T. taxifolia*, Arn. "Stinking Cedar." Sargent, t. 512. Florida, United States.

* Masters in *Journ. Linn. Soc.*, xxx, 4 (1893).

Ginkgo biloba.
Botanic Gardens, Sydney.

Torreya nucifera.
Botanic Gardens, Sydney

A medium-sized tree. Leaves slightly rounded on the back, pale on the lower surface. Purple fruit. (Sargent.)

It does only moderately well in the Sydney Botanic Gardens. It is, however, not in good soil. Taxaceæ are very responsive to good treatment as regards depth of good soil and moisture. In the Sydney Botanic Gardens the soil is often very light, and sometimes the dry summers are trying.

M 25 (Sydney Botanic Gardens).

Tribe - TAXINEÆ.

Sub-tribe 1.—*Taxeæ.*

4. Phyllocladus, L. C. Richard.

A genus in which the "leaves" are not true leaves, but metamorphosed branchlets, termed phylloclades or cladodes. These phylloclades vary a good deal in shape even in the same tree.

Six species are known, three from New Zealand, one from Tasmania, one from Borneo (*hypophylla,* Hook f.), and one (*protractus,* (Warb.) (Pilger) from New Guinea and the Philippines. The two last need not be further considered at this place.

The Sydney district is unsuited to the proper development of these beautiful trees, which should be grown by every admirer of fine trees in New England, the Blue Mountains, the Southern Tableland, &c. But a fair depth of soil is indispensable.

(1.) *P. rhomboidalis,* Hook. f.

In Tasmania it is universally known as "Celery Top," or "Celery Top Pine."

This tree, which attains a size of 50 or 60 feet in Tasmania, is common on mountains, particularly in the south and west.

It will not flourish in the Sydney districts, but should be tried in colder New South Wales.

Cheeseman (*Manual of the New Zealand Flora,* p. 658) gives the following key to the New Zealand species:—

* Cladodes pinnately arranged.

Tree, 50-70 ft. Cladodes, ½-1 in. Female flowers on the margins of the cladodes .. .. 1. *P. trichomanoides.*

Tree, 25-40 ft. Cladodes, 1-2½ in. Female flowers peduncled on the rhachis below the cladodes .. .. 2. *P. glaucus*

** Cladodes simple.

Shrub or tree, 5-25 ft. Cladodes, ½-1 in. Female flowers on the margins of the cladodes near the base .. .. 3. *P. alpinus.*

They are all well figured in Kirk's "Forest Flora of New Zealand."

(2.) *P. trichomanoides,* Don.

The Maori names are "Tanekaha" and "Toatoa," and the New Zealand name "Celery-leaved Pine."

Found in both the North and South Islands, and in the latter from the sea-level to 2,500 feet. Yields a valuable timber, and the bark is often used for tanning.

M 19, L 9 (Sydney Botanic Gardens).

(3.) *P. glaucus*, Carrière.

"Toatoa."

"A very distinct species, quite the most handsome of the New Zealand Taxads, and easily recognised by the robust branches, very large cladodes, and large female flowers." (Cheeseman.)

Confined to the North Island, sea-level to 2,000 feet.

5. Taxus, L. The "Yew."

The ancient dark leaved species cultivated in Europe from time immemorial; often seen in churchyards, and often trimmed to shape in gardens.

(1.) *T. baccata*, L. "The common Yew."

All the forms of *Taxus* are closely allied.

The foliage is poisonous to cattle. The wood was commonly used for bows in the olden times.

The Yew will not flourish in Sydney; it does well in the cooler, well-watered parts of the State.

There is a so-called variety, *argentea*, the *T. elegantissima* of nurserymen, at M 25 (Sydney Botanic Gardens); this form does fairly well in Sydney.

(2.) *T. brevifolia*, Nuttall. "Californian Yew."

Sargent, t. 514.

Leaves short, yellowish-green.

A tree of considerable size in its native country (North-western America—British Columbia to southern California).

It does not appear to be in New South Wales, though seeds from southern Californian localities should do well.

(3.) *T. cuspidata*, Sieb. and Zucc. "Japanese Yew."

A small tree, native of Japan, where it has been cultivated from time immemorial. It does only fairly in Sydney.

M 25 (Sydney Botanic Gardens).

(4.) *T. floridana*, Chapm. "Florida Yew."

Sargent, t. 515.

It is a short, bushy tree. Leaves elongated, usually falcate, dark green. It is confined to a small area in Florida, U.S.A. It would probably succeed in eastern New South Wales.

6. Dacrydium, Solander.

A genus of trees and shrubs, with heteromorphic foliage.

There are twelve species, of which seven belong to New Zealand and one to Tasmania. Only two are of special importance.

(1.) *D. cupressinum*, Soland. The "Rimu" or "Red Pine."

A large tree; abundant in forests throughout New Zealand, extending from the sea-level to 2,500 feet.

Cheeseman (Manual, p. 654) says of it :—"A well-known tree, the young state of which, with its graceful shape and pale-green pendent branches, is, perhaps, as beautiful and attractive as any tree in New Zealand. The wood is deep red, strong, hard, and heavy, but often twisted in the grain. It is largely used for building purposes of all kinds, and for the manufacture of furniture, but is not nearly as durable as either Kauri or Totara."

This tree always suffers during dry weather in Sydney, a remark which is true of many introduced Conifers.

M 17, 19 (Sydney Botanic Gardens).

(2.) *D. Franklinii*, Hook. f.

The well known Huon Pine of Tasmania. A large tree, common in swampy localities in the south and west from the Upper Huon River to Port Davey and Macquarie Harbour.

It is so appreciated in Tasmania for its very valuable timber that it is now getting scarce.

Experiments with this tree in Sydney have so far been a failure, but it should certainly be tried elsewhere.

Sub-tribe 2.—*Podocarpeæ*.

7. Podocarpus, L'Hérit.

So named because of its fleshy fruit-stalk.

(1.) *P. elata*, R.Br. "She or Brown Pine."

A handsome tree, yielding durable timber, and native of the eastern part of the State. It flourishes in the Sydney district, and is well worthy of experimental cultivation.

For a figure and a full account of it, see my "Forest Flora of New South Wales," part 4.*

M 11, 24, and other places (Sydney Botanic Gardens).

(2.) *P. spinulosa*, R.Br.

A dwarf, rather spreading shrub, with somewhat prickly foliage, found in moist localities in the eastern parts of the State. It is well worthy of a place in the garden, because of its dense, neat foliage.

M 22 (Sydney Botanic Gardens).

(3.) *P. pectinata*, Planch. (*Dacrydium Pancheri*, Brongn. and Gris.). New Caledonia.

We had a specimen of this in the Sydney Botanic Gardens for a number of years, but it did not flourish, and finally died. It was a small tree, and should be further experimented upon in good soil and in a sheltered situation.

* Government Printer, Sydney. 1s. per Part. A quarto work, each Part of which contains 4 plates, and usually photographic illustrations in addition.

(4.) *P. Totara*, D. Don.

The "Totara" of New Zealand. Common in forests from the North Cape to the south-east of Otago, from the sea-level to 2,000 feet.

A large tree, wood red, very durable, resists Teredo, and hence is esteemed for piles for wharfs. The Maoris used it for their war canoes and also for their carved houses. It will succeed in many parts of coastal New South Wales and on mountain ranges.

M 16, L 8 (Sydney Botanic Gardens), where it does very well. It does not like exposed places.

(5.) *P. dacrydioides*, A. Rich. "White Pine," "Kakikatea" or "Kahika."

This is common in the North and South Islands of New Zealand, and it extends from the sea-level to 2,000 feet. It is a tall tree, and in damp localities often grows gregariously, forming dense forests. It is a handsome species with small leaves, and the Sydney district is a little too warm for it. It is well known for its timber, "White Pine," which produces the wood most in demand for butter boxes.

M 17 (Sydney Botanic Gardens), where it does fairly well.

(6.) *P. ferruginea*, D. Don. "Black Pine," "Miro" or "Toromiro."

This also is a New Zealand species. "A tall forest-tree 50–80 feet high with a rather narrow round-topped head." (Cheeseman.)

It is a handsome species, and occurs in forests in the North and South Islands, from the sea-level to 3,000 feet, thus being rather more hardy than the preceding species. It yields a valuable timber.

Not in the Sydney Botanic Gardens.

(7.) *P. latifolia*, Wall. Is an Indian species with handsome broad leaves (say over an inch broad and 4 inches long), reminding one very much of an *Agathis*. It should do in the warmer parts of coastal New South Wales.

(8.) *P. Blumei*, Endl.

From the Philippines has even larger leaves. Perhaps it could succeed here also.

(9.) *P. neriifolia*, Don. (Syn. *P. macrophyllus*, Wall non Don). The "Oleander-leaved Podocarpus."

See *Bot. Mag.* t. 4655.

A much branched shrub or small tree from the temperate Himalayas, also Burma, Malaysia, &c. It should do in the Sydney district.

(10.) *P. bracteata*, Blume.

Native of Java and South Sea Islands. Seemann gives the Fijian vernacular as "Gagali."

With handsome foliage and a fair-sized tree.

M 17 (Sydney Botanic Gardens). It is in too crowded a locality to do justice to it.

(11.) *P. cupressina*, R.Br.

Burma and Malaysia.

Podocarpus elata.
Botanic Gardens, Sydney.

Prumnopitys elegans.
Botanic Gardens, Sydney.

A tree of medium size in Sydney; would be larger if it had better soil and more room. It evidently is of some promise for eastern New South Wales.

M 17 (Sydney Botanic Gardens).

(12.) *P. vitiensis*, Seemann. "Kau solo" of Fiji.

Figured and described in the *Flora Vitiensis*. Seemann describes it as one of the finest Coniferæ he has ever seen. It is a tall tree in its native islands, with specially handsome foliage. In the Sydney Botanic Gardens it is a beautiful, medium-sized tree. It would be a great acquisition to the warmer coast districts.

L 20 d (Sydney Botanic Gardens).

(13.) *P. Nageia*, R. Br. "Nagi" of the Japanese.

A medium sized tree, which has been cultivated in Japan from time immemorial.

"With the Japanese it is a great favourite, especially a variety in which the leaves are marked with broad white stripes, and this they use for dwarfing and pot culture." (Veitch.)

Not in the Sydney Botanic Gardens.

(14.) *P. macrophylla*, Don. "Maki" of the Japanese.

A low or medium sized tree of 25–40 feet in height, not broad-leaved as its name would denote, but rather narrow and erect. It is a common Japanese tree, although not known to be endemic, and is largely cultivated by Japanese horticulturists. "Around Tokio the common form is much used as a hedge plant and is often cut into fantastic shapes, whilst the variegated forms are preferred for pot culture and dwarfing." Two of the best known varieties bear the names *argenteo-variegatus* and *aureo-variegatus*.

A variegated specimen is in the bed of variegated plants, L 35 b (Sydney Botanic Gardens).

(15.) *P. japonica*, Siebold.

Japan.

In Sydney this is a bushy shrub about 6 feet high, reminding one of a small *Taxus*.

M 17, L 9 (Sydney Botanic Gardens).

(16.) *P. elongata*, L'Hérit (*P. pruinosa*, Zeyh.) South Africa.

This species grew in the Sydney Botanic Gardens for many years, but was a stunted plant of, say, 3 feet. It might be tried again.

(17.) *P. nubigena*, Lindl.

"A tree of Yew-like aspect, of variable dimensions according to the situation in which it is growing" (Veitch). Leaves, say, 1½ inch long.

It is a native of southern Chili, and is associated with and growing under the same conditions as *Saxegothea conspicua*. It should flourish in the bleakest mountain localities of southern Monaro.

(18.) *P. chilina*, L. C. Rich, is a much branched tree of 40–50 feet from the sub-alpine Andean region of Chili. It is hardy in the south of England and Ireland, and as it is a beautiful species, it would be desirable to introduce it into the cooler regions of New South Wales.

It has leaves several inches long, much longer, indeed, that *P. nubigena*.

8. Prumnopitys.

This genus is closely allied to *Podocarpus*, and differs from it in the absence of the fleshy fruit-stalk or "receptaculum."

(1.) *P. elegans*, Philippi.

A medium sized tree of the Andes of southern Chili, where it has a vertical range of 4,500 to 6,000 feet.

It is a bushy, handsome tree, with damson-like fruit. It flourishes well in the Sydney district, and is also hardy in the south-western counties of England and Ireland, so that it should be hardy over extensive areas in the eastern half of this State.

L 35 b (Sydney Botanic Gardens).

(2.) *P. Thunbergii*, Hook. in *Lond. Journ. Bot.*, i, 657 (1842), with figure (t. 22).

South Africa.

A fairly fast-growing, ornamental tree, with comparatively small leaves. Hardy in the eastern half of the State, and worthy of more extensive introduction.

L 1, 31 b, 6 (Sydney Botanic Gardens), where it flourishes in dry situations.

(3.) *P. spicata*, Masters. (*Podocarpus spicata*, R.Br.)

The "Matai," "Mai," or "Black Pine" of New Zealand.

Found in the North and South Islands and Stewart Island, and extending from the sea-level to 2,000 feet.

The fruit is globose, black or nearly so, and ¼ to ⅓ inch in diameter. Its timber is brownish, hard, and of great strength and durability.

Not in the Sydney Botanic Gardens.

9. Saxegothea, Lindl.

The fruit is a fleshy globose body, less than an inch in diameter, formed by the coalescence of the fertilised scales, the individuality of which is indicated by the projecting apex.

(1.) *S. conspicua*, Lindl. "Prince Consort's Yew."

A remarkable small tree, with Yew-like aspect.

Grows (with *Podocarpus nubigena*) near the snow-line in southern Chili. We can only hope to grow this small tree in the highest southern mountain ranges, but it is of such high botanical interest that it is to be hoped that connoisseurs of trees in the Monaro will endeavour to obtain it.

A small shrub formerly in the Sydney Botanic Gardens, reminding one of *Taxus*. It grew very slowly and finally died.

10. Microcachrys, Hook. f.

The scales of the young cones assume a pulpy texture and bright (crimson) colour, "a character probably unique in the Order" (Veitch's Manual). Like Saxegothea, it forms a direct transition from the Taxads to the Coniferæ with imbricated leaves.

(1.) *M. tetragona*, Hook. f.

Figured in *Fl. Tas.*; also *Bot. Mag.* t. 5576.

A creeping, spreading shrub common on many mountain tops in Tasmania

It can only be expected to grow in the coldest districts of New South Wales, where there is plenty of water. "Its only value (in England) as a garden plant is for conservatory decoration, for which the elegant habit it can be made to assume under pot culture, its neat foliage and bright red fruits, render it highly suitable." (Veitch's Manual.)

(*To be continued.*)

Notes on Western Timbers.

(See February *Gazette*, p. 143, and April, p. 353.)

Mr. R. J. Dalton, of Tinapagee, Wanaaring, has forwarded additional specimens, by which the following names can be given:—

"Macla." This was used by the blacks in the old days for internal pains and sprains. The seeds and pulp were taken from the fruit and soaked in water.

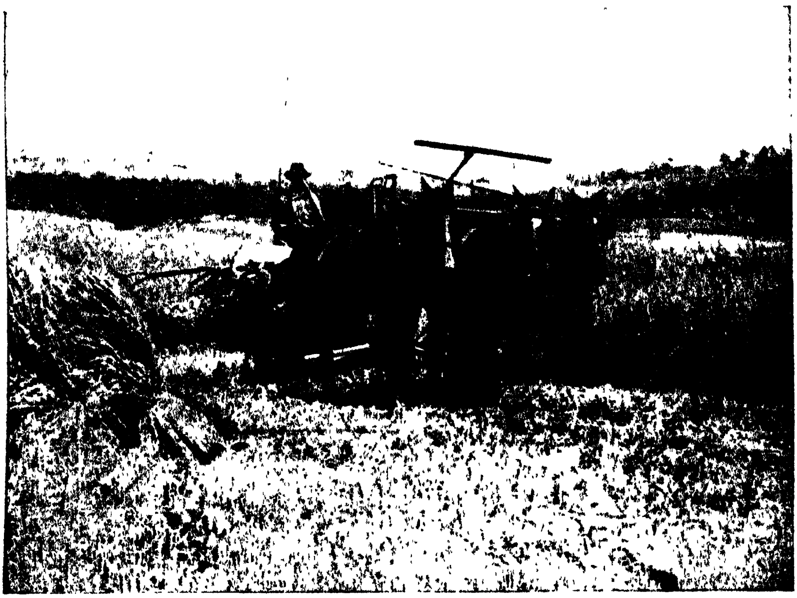
This is *Pittosporum phillyroides*. See Maiden's "Forest Flora of New South Wales," Part i, for figure and description.

Another medicine tree of the blacks sent is *Santalum lanceolatum*, R.Br. The leaves were used for boils, sores, and gonorrhœa. See a note in "Forest Flora of New South Wales," Part xx, p. 195.

At No. 8, p. 144 of the February *Gazette*, the word "Medium" should read "Medicine." The blacks have many medicine trees.

Field Experiments at Bathurst Experimental Farm, 1906.

R. W. PEACOCK.



Harvesting Wheat, Bathurst Experimental Farm.
Crop was fed off by sheep.

OATS grown at Bathurst Experimental Farm, 1906.

Variety.	Previous crop.	No. of paddock.	Area.	Date sown.	Date harvested.	Seed sown per acre.	Yield per acre.	Rainfall during growth.	Rainfall for year.	Remarks.
			acres.			lb.	bus. lb.	inches.	inches.	
Algerian ..	Maize.	2	2·36	21 May	11 Dec.	64	68 36	13·43	22·89	Not affected by frost.
Red Rust-proof		2	1·65	21 ,,	8 ,,	58½	76 24	13·41		,, ,,
Potato ..		2	1 7	19 ,,	13 ,,	57½	51 18	13·48		,, ,,
Carter's Royal Cluster		2	1·01	19 ,,	15 ,,	55½	45 23	13·43		,, ,,
Abundance ..		2	1·25	18 ,,	15 ,,	49½	64 31	13·43		,, ,,

Total area, 7·97 acres; total yield, 508 bushels 23 lb.; average yield, 63 bushels 7 lb. per acre.

BARLEYS grown at Bathurst Experimental Farm, 1906.

Variety.	Previous crop.	No. of paddock.	Area.	Date sown.	Date harvested.	Seed sown per acre.	Yield per acre.	Rainfall during growth.	Rainfall for year.	Remarks.
			acres.			lb.	bus. lb	inches.	inches.	
Cape	Maize.	2	2·03	16 May	4 Dec.	44	65 2	13·41	22·89	Not frosted.
Skinless ..	Maize.	2	·98	17 ,,	26 Nov.	37	26 10	13·10	22·89	Badly frosted.
Albert	Maize.	2	·97	16 ,,	14 Dec.	43½	56 12	13·43	22·89	Not frosted.
Kinver Chevalier	Maize.	2	1·01	16 ,,	11 Dec.	48	46 1	13·43	22·89	,,
Standwell ..	Maize.	2	2·75	12 ,,	10 Dec.	43	41 49	14·05	22·89	Badly frosted.

Total area, 7·74 acres; total yield, 374 bushels 11 lb; average yield, per acre, 48 bushels 17 lb.

WHEATS grown at Bathurst Experimental Farm, 1906.

Variety.	Previous crop.	Area.	Date sown.	Seed sown per acre.	Date harvested.	Yield per acre.	Rainfall during growth.	Rainfall for year.	No. of paddock.	Remarks.
		acres.		lb.		bus. lb.	inches.			
Dart's Imperial (No. 1)	Maize	1·03	9 May	33	26 Dec.	36 5	15·22	22·89	2	Not frosted.
,, ,, (No. 2)	,, ..	1	9 ,,	31	26 ,,	37 47	15·22	22·89	2	,,
Bobs ..	½ Maize, ½ Scarlet Clover	4·69	27 April	31	19 ,,	26 33	14·67	22·89	2	Slightly frosted.
Power's Fife ..	Scarlet Clover	·85	18 ,,	24	26 ,,	25 49	15·81	22·89	2	,,
Lambrigg White Essex	,, ..	·61	18 ,,	26	27 ,,	34 20	15·81	22·89	2	,,
Cretan	,, .	1·34	18 ,,	28	26 ,,	27 53	15·81	22·89	2	Not frosted.
Sussex . . .	,,	1	17 ,,	31	26 ,,	24 48	15·81	22·89	2	Frosted
Schneider	,, .	1·55	17 ,,	31½	19 ,,	20 5	15·26	22·89	2	Badly frosted.
Federation .. .	,, .	·96	16 ,,	33½	21 ,,	26 26	15·26	22·89	2	,,
,, .. .	Tares .	1·85	16 ,,	33½	21 ,,	25 41	15·26	22·89	2	,,
Rymer	,, ..	·96	16 ,,	24¾	19 ,,	27 6	15·26	22·89	2	,,
John Brown	,, ...	1·31	16 ,,	24½	20 ,,	20 32	15·26	22·89	2	,,
Red Glyndon .. .	,, .	·64	16 ,,	30¾	26 ,,	24 47	15·81	22·89	2	,,
Waniassa	,, .	·76	12 ,,	26	26 ,,	24 7	15·81	22·89	2	,,

WHEATS grown at Bathurst Experimental Farm, 1906—*continued.*

Variety.	Previous crop.	Area.	Date sown.	Seed sown per acre.	Date harvested.	Yield per acre.	Rainfall during growth.	Rainfall for year.	No. of paddock.	Remarks.
		acres.		lb.		bus. lb.	inches.			
Bobs	Tares	2·25	14 April	26½	14 Dec.	16 50	14·64		2	Very badly frosted
,, ,,	Wheat ..	2	14 ,,	26½	21 ,,	18 24	15·26		2	,, ,,
Cleveland	Barley	2·9	20 ,,	37¼	22 ,,	34 24	15·11		1A	Frosted.
Tarragon	,,	2·75	19 ,,	29¼	22 ,,	32 40	15·26		1 A	,,
Steinwedel	Maize ..	2·81	2 ,,	43¾	8 ,,	26 12	14·62		19	Slightly frosted; fed off by sheep
Bobs	,,	3·06	3 ,,	45⅓	10 ,,	29 27	14·64		19	Not frosted; fed off by sheep.
White Hogan ..	,,	·79	3 ,,	31½	12 ,,	25 27	14·64		19	Not frosted, not eaten off
,, ,,	,,	3·31	3 ,,	31½	21 ,,	18 16	15·26		19	Not frosted; fed off by sheep.
Cleveland	,,	3·14	4 ,,	45⅓	27 ,,	25 2	15·81		19	,, ,,
Federation	Linseed	1	2 July	36	27 ,,	30 27	11·44		7	Not frosted.
Cleveland	Rape	11·51	9 May	43	28 ,,	25 24	15·22		18	,,
John Brown	Maize	3·77	4 ,,	32	14 ,,	27 47	14·05	22·89	27	Slightly frosted.
Power's Fife	,,	2·45	5 ,,	43	20 ,,	22 58	15·22		27	Not frosted.
Federation	Rape	3·5	12 April	25½	11 ,,	21 30	14·64		26	Badly frosted.
Tarragon	,,	1·35	10 ,,	25½	17 ,,	30 0	14·64		26	Not frosted.
Jumbuck	,,	1·93	10 ,,	25¼	13 ,,	32 0	14·64		26	,,
Bunyip ..	,,	1·45	10 ,,	22	7 ,,	28 37	14·62		26	Badly frosted.
Blue Federation	,,	3	11 ,,	25	17 ,,	35 19	14·64		26	Not frosted.
Bobs	,,	1·16	11 ,,	24½	13 ,,	20 25	14·64		26	,,
Nonpariel	,,	1·26	11 ,,	28¾	13 ,,	31 18	14·64		26	,,
Cleveland	,,	·55	11 ,,	35½	17 ,,	28 32	14·64		26	,,
Steinwedel	Wheat	7·2	1 May	27¼	20 ,,	24 42	14·67		4	,,
Bobs	,,	6·92	24 April	27¼	17 ,,	24 24	14·05		5	Slightly frosted.

Total area, 88·61 acres. Total yield, 2,317 bushels 48 lb.; average yield per acre, 26 bushels 9 lb.

The following is the monthly distribution of the rainfall :—

January	... 76 points.	July...	... 89 points.
February	... 255 „	August	... 200 „
March	... 377 „	September	... 228 „
April	... 59 „	October	... 287 „
May	... 143 „	November	... 217 „
June	... 235 „	December	.. 123 „

It will thus be seen that the rainfall was adequate and the distribution favourable for good yields. Unfortunately, unseasonable frosts occurred, which so damaged many of the wheat crops as to considerably reduce their yields. This applied to a majority of the varieties, excepting the very late ones.

The frosts occurred on November 6 and November 11, when most of the varieties were in bloom. For this reason the yields of varieties are not comparable. The early maturing, which generally give the highest yields, suffered most. For Notes on Frost, see issue of *Gazette* for April, 1907.

The disastrous influence of the frosts is regrettable, as many valuable variety tests, rotation, and manurial experiments were in progress. The tabulated results from such are therefore not a true reflex of the treatment given.

RHODES GRASS.

"I HAVE just read with interest your article in the December number of the *Agricultural Gazette* on Rhodes Grass (*Chloris Gayana*). We have grown it one year here with moderate irrigation, and it has done better than any other grass that we have imported. It is extremely drought-resistant, heat-resistant, and still quite green after all our frosts."—J. J. Thornber, Botanist, Arizona Agricultural Experimental Station, U.S.A., in a letter to Mr. Maiden.

In view of the fact that we are feeling our way to the introduction of additional grasses suitable for drought-resistant and frosty localities, this note is of interest. The State of Arizona has much in common with the drier parts of New South Wales.

The Settler's Guide.

PISÉ.

GEORGE L. SUTTON,
Cowra Experiment Farm.

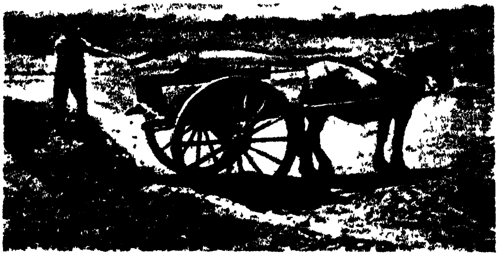
PISÉ is a material readily obtainable by the settler of which cheap and durable buildings can be easily and substantially erected. Such buildings possess the advantage of maintaining a fairly uniform temperature throughout the year. They are warm in winter and cool in summer, and therefore possess distinct advantages for a climate such as prevails over a very wide area of this State.

For the construction of pastoral or agricultural buildings, especially in districts remote from railways, or from towns in which other building materials are cheap or easily procurable, pisé, which is simply earth or soil shovelled into temporary casings, which regulate the forms and dimensions of the walls required, and then rammed until thoroughly solid, is particularly well adapted. In the country earth is plentiful and readily obtainable; in the city or town such is not the case, and this fact, combined with the very bulky nature of the material, prohibits its use in such centres of population.

To the selector or settler, who, like many of our successful pioneers, is not burdened with a superfluity of hard cash, but who possesses an abundant capital of energy, combined with a certain amount of handiness, pisé has an additional advantage (which it shares with slabs, wattle and dab, etc.) over most other building materials, in that it affords him an opportunity of erecting his homesteading largely as the result of his own labour.

As a building material pisé is infinitely superior and more durable than slabs, galvanized iron, or weatherboards. In fact it is questionable whether it is not more suitable for our climate, and therefore to be preferred to brick-work; for, pisé buildings, properly protected and finished, are quite as durable and much cooler than buildings constructed with solid brick walls. This statement may be questioned by some whose knowledge of pisé is limited to buildings so badly planned that the very elementary principles of building construction have been neglected. This neglect, which is all too common, makes things bad enough, but when to it is added, as is sometimes the case, indifferent workmanship, combined with the use of unsuitable material, the result does not call for admiration, and it is not surprising that a bad impression is created. With no other knowledge of pisé it is only natural to condemn it because of such specimens, but under similar circumstances other better known building materials of proved excellence would also be condemned. Brickwork would just as readily be condemned if its building qualities had to be estimated by the appearance presented by a brick building which had been constructed of badly-burnt bricks laid by unskilful tradesmen

on an imperfectly thought-out plan. Just as with other building materials the possibilities of this material can only be judged by an examination of properly planned and constructed examples of the pisé builder's art. Such are found here and there throughout the country, pleasing to look at, affording comfort and satisfaction to their owners. A properly constructed pisé building can be finished to suit the taste of the most fastidious. Even without plaster the walls can be "floated" down and a "skin" obtained on them which, when limewashed, resembles stonework. When plastered inside and out they possess the advantages of a stone house, and are erected at a fraction of the cost.

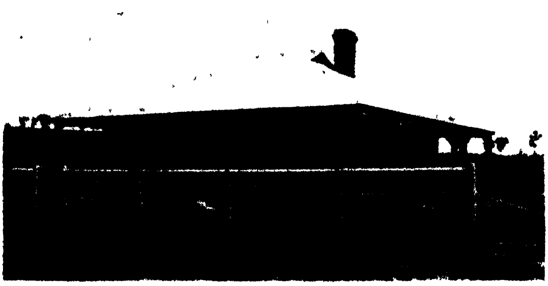


The Beginning.
Obtaining the earth required for pisé

Pisé work is very slightly dearer than galvanized iron and studding, cheaper than weatherboards, and about half the cost of 9-inch brickwork.

Some idea may be formed of the durability of pisé by the fact that there is at present at "North Logan" a stable built of pisé which has been in constant use for over sixty years, and which at the present time is in good order. The good condition of this stable is the more surprising because the external walls are unprotected from the weather, and it is generally recognised that pisé work, especially if unplastered, should be protected from the direct action of rain. Pisé buildings are said to have a life of a century and a half.

The stability of pisé buildings is beyond question, as is proved by the following instance:—At Lambrigg, a second-storey brick building, with 14-inch walls, and containing ten rooms, is built upon a lower storey of pisé. The bricklayer who had the contract for erecting the brick portion of the house refused, as it was built upon pisé, to guarantee his work. Some time after the completion of the house he visited it, and after a thorough examination of the building declared that it was the most substantial brick house in the district, as it had not a crack in it, a feature which was somewhat unusual in that locality. Another case bearing on the



The End.
Pisé residence, Cowra Experimental Farm.

same subject is that connected with the residence of Mr. A. Donaldson, Sproule's Lagoon, Temora. When this building was being constructed the workmen omitted to leave holes for the bolts which were to secure the verandah plates to the walls, as it was thought these could be readily bored out afterwards with an augur. On attempting to bore out these holes on the completion of the building, and when the pisé work had become drier, the operation of boring proved so difficult as to be practically impossible, and had to be abandoned. Fortunately by slightly raising the position of the verandah plate it was possible to make use of the holes left when the bolts used for holding the "boxes" together were withdrawn.

It is interesting to mention that this residence is a building which graphically illustrates the possibilities and advantages of pisé. It is a dwelling of which Mr. Donaldson is, and any farmer might be, justly proud.

The merits of pisé work have been recognised in France, India, Mexico, and California for years past, and seeing its equal suitability for our climate, it is surprising that these merits have not led to its being more extensively used. The principal reason for this seems to be because our builders are averse to undertaking this class of work, and in consequence the bulk of it is placed in the hands of untrained men, who, whilst quite fitted to carry out the pisé work, are not competent to undertake the other constructive work of a building, yet they do not hesitate to do this, as well as to undertake the more important work (though unrecognised as being so) of planning out the building. The result is in most cases an improperly planned and defectively constructed building, which appeals to no one, but has a tendency to bring pisé into disrepute.

The reason for a builder's repugnance to undertake pisé work is not far to seek. For the successful carrying out of his work a builder relies upon skilled tradesmen; our tradesmen are trained in cities and towns, and as pisé is not a suitable building material for such places, tradesmen do not become familiar with it. A good builder with a reputation to lose shrinks from placing that reputation at the mercy of a pisé builder, who is not recognised as a tradesman, and in whom, in consequence of this, a builder is likely to have little or no confidence.

The actual erection of pisé work presents so little difficulty that it can be done by anyone who has sufficient strength to shovel earth and wield a rammer, provided he will exercise sufficient care to see that the moulds, or boxes, into which the earth is shovelled are kept plumb and in straight lines. The average settler, even with no previous knowledge of pisé work or building construction, need have no hesitation in undertaking the pisé work of his own buildings if he works to a well thought-out plan drawn up by somebody competent to do so. That this statement is not overdrawn is proved by the fact that the pisé work of the cottage, illustrations of which accompany this article, was done by men who had no previous experience of pisé work or building construction, but who were accustomed to and are employed for the ordinary work of the farm.

The necessity of having a plan prepared by someone who understands the principles and requirements of simple building construction, before undertaking the erection of any building, cannot be too strongly emphasised. This great need, which is often overlooked by the settler, cannot be economically dispensed with. The securing of a properly prepared plan is of the very greatest value towards obtaining a building of the maximum strength and durability, combined with the best appearance and greatest convenience, for the least cost. Even when a settler undertakes the pisé work of his own building, it will only be in rare instances that he will not have the advantage of trained supervision during its erection. The services of a tradesman will invariably be found necessary to make door and window frames, construct the roof, etc. This workman can be engaged when the building is started, and whilst preparing the timbers of the roof, in readiness for the time when they will be required on the completion of the pisé work, can supervise the fixing of the door and window frames, and see they are set correctly and in their proper places.

Pisé walls are constructed in sections, the extent of which is regulated by the supply of casings available. These casings (technically known as "boxes") regulate the shape and thickness of the walls and the height of the sections, and are made of stout planks held together by ledges or cross planks, which should be stout enough to keep the "boxes" from warping. The dimensions of the "boxes" are optional, but vary chiefly with regard to width; this ranges from 12 to 36 inches. This latter width was adopted when making the "boxes" used at this farm, and it has proved very suitable and convenient. there seems no substantial reason why narrower boxes are to be preferred. The maximum size for convenient use may be taken to be about 10 feet long and 3 feet wide. The "boxes" are put together so as to form moulds corresponding to the shape and thickness of the walls to be erected; they are held together by ¾ inch round iron rods, and kept the required distance apart by the use of pieces of batten or scantling cut to the necessary length, *i.e.*, the thickness of the walls. As the earth is filled in the gauge battens become unnecessary, and are removed by the workmen. The rods referred to (known as "bolts") have a square bolthead at one end, and have holes punched at various distances from the bolthead to correspond with the varying thicknesses of the walls to be erected.

Into the moulds formed by the boxes the earth is shovelled in layers of 4 or 5 inches, and then rammed until thoroughly solid before another layer is put in. On the completion of the section, *i.e.*, when the mould is full and well rammed, the keys or pins are knocked out of the "bolts," and the "boxes" taken apart and erected on another portion of the building. The top of that portion of the pisé work on which it is proposed to erect another section should be well moistened and covered with wet bags some hours before the mould is formed. The bottom of the mould should overlap the top of the pisé work by about 6 inches. After the "boxes" are put together, the top layer of pisé should be loosened with a pick so as to form a bond with the section about to be built, and if this section adjoins one already built,

the ends of the latter should be bevelled off so as not to form a straight longitudinal joint.

Almost any earth containing a fair amount of loam is suitable for pisé, but a pipeclay loam, with which gravel is intermingled, is best. Soil which cakes after a heavy rain, or which if ploughed or dug when dry turns up in hard clods is very suitable. Material which is too sandy will fret away, and one containing clay will crack when dry. Soils containing these defects should be avoided. There is, however, such a wide range of soils which are suitable that a holding of any size on which suitable soil cannot be found will be the exception. It is possible to remedy the defects found in one soil by mixing it with another soil, but very rarely will such a course be necessary. Any vegetation growing on the surface of the earth selected should be removed, as also should any roots, bits of stick, or vegetable matter likely to decay. The earth is best used as it is dug, and if too dry should be brought to the correct moist condition by watering it, about two days before it is to be used; no amount of tempering after it is dug will render it as suitable, as watering in the solid as described. The earth should be just moist enough to be crumbly, and yet adhesive enough to retain the impression of the fingers when pressed in the hand. If too moist it will stick to the rammer and work up squashy; if too dry it will work up loose under the rammer. If in that condition which is best adapted for ramming a fence post it is just right.

The plant required will depend upon the number of men to be employed. Three is the least number that can be economically employed—two attending to the boxes and ramming, and one carting earth from its location to the building and assisting generally. The plant required for this number of men will be described. If more are engaged, additional plant of the same character will be found advantageous.

The necessary plant will consist of—

- 2 Wooden rammers.
- 1 Iron shod rammer.
- 2 Straight boxes.
- 2 Angle boxes.
- 3 Casings for blocking up the ends of boxes.
- Bolts and keys for same.
- 12 Gauge rods.
- Washers.—A liberal supply of ¾ inch washers.
- 2 Shovels.
- 1 Spade.
- A horse and dray, or other means for transporting the material to the building.

(*To be continued.*)

The Cross-breeding of Sheep.

R. H. GENNYS,
Glen Innes Experimental Farm.

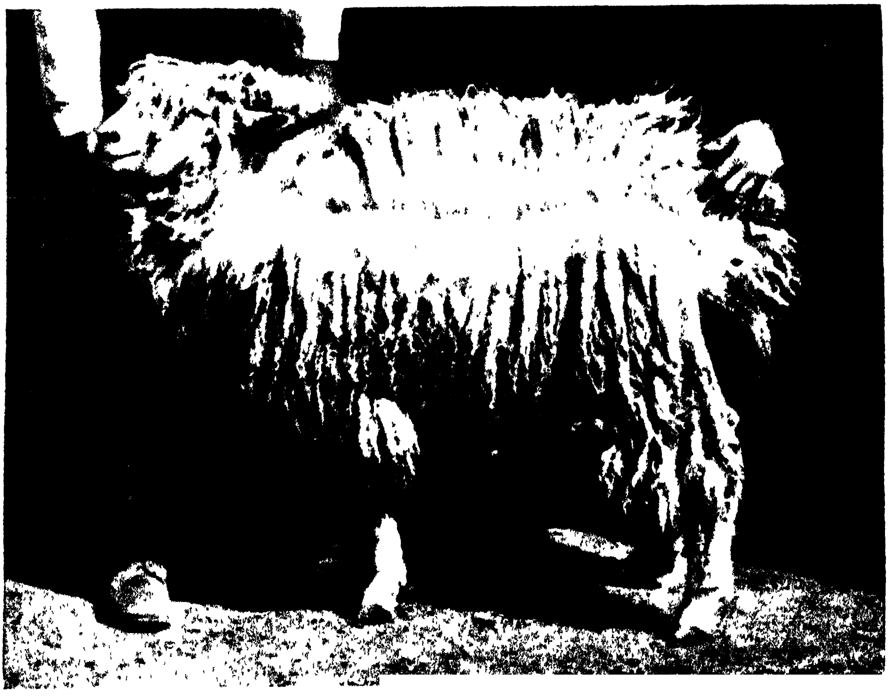
In this article the Merino, being by far the cheapest and most easily obtainable sheep in Australia, is taken as the dam in the first crosses in every case. This being the case, the Merino blood, of course, in second cross or grades, and in comebacks to a greater or lesser degree, is dependent on whether it is intended to breed the sheep for their wool chiefly or for

Lincoln Ram.
Glen Innes Experimental Farm.

their mutton—the latter including fat lambs for market and suitable for export. And here it may be said, this article deals principally with mutton sheep, which is undoubtedly the class most profitable for the small farmer.

The object is to produce early-maturing sorts of good quality and shape. It is obvious that if lambs of the required dead weights, say, 30

to 40 lb., can be got ready at four months or earlier instead of five months, this is a distinct advantage. Money is turned in more quickly; a certain amount of feed the lambs are grazed on is saved, and ewes are relieved and able to regain condition before going to ram again. Further, the most tender and succulent lamb-meat is produced from suckers. In lamb-rearing, the wool may be neglected somewhat for the most desirable carcass. The ram used, of whatever breed, should always be a pure-bred of his kind, as he will be more likely to impress his image and other qualities on his offspring. The breed he belongs to should possess early-maturing qualities; he should be weighty, and possess good mutton qualities in a marked degree.



Lincoln Ram, 10 months old, showing length of staple.
Glen Innes Experimental Farm.

The ewe should possess a good carcass, well developed digestive organs, and good udder, indicating a good milker (most important points hitherto much neglected in sheep breeding); it is obvious how important this is in lamb raising. In this connection, the cross-bred mother is superior to the Merino; she is more prolific, and can be bred from with advantage a year earlier. A well-developed two-tooth cross-bred ewe can be put to the rams, whereas a Merino should be four-tooth. In both cases maiden ewes should be bred from in preference to older sheep. Where large big-

headed British rams are used maiden ewes appear to more readily adapt themselves to circumstances; the deaths during parturition being less. In this connection the Southdown and English Leicester are desirable sires, as they have smaller and narrower heads than most other breeds.

Mating.—It is generally admitted that ewes in rapidly improving condition and not too fat are likely to throw the largest percentage of lambs. Under average conditions the ram should have not more than sixty ewes to serve, and he should be in good strong condition, but not too fat.

Lambing.—The ewes should be in good condition, but not too fat. They should be on good pasture from the time of lambing until the lambs are

English Leicester Ram.
Glen Innes Experimental Farm

sold or weaned. They should be kept in small paddocks under supervision, in order that if assistance is required it may be rendered promptly.

Lamb-marking, &c.—Lambs should be ear-marked, detailed, and castrated at an early age, say from 10 to 14 days old, as they recover from operations more quickly than when older.

The latest method is to sear off the tails with a red-hot iron, instead of cutting off with a knife; the former method saves much loss of blood, and consequently little or no check is received from the operation. Lambs do not appear to sulk after searing as they do after cutting off; the cut dries and heals quickly. If a disinfectant is used, such as Stockholm tar or

sheep-dip, do not put it on the seared part but smear it on the wool adjacent thereto. The object of searing is to dry up the wound, that of the tar, &c., to keep the flies away from the cut by the smell near it.

When searing, make the iron red hot. Do not press too heavily. A moderate time in searing makes the loss of blood less and the operation more complete.

Castrate lambs with care and at an early age; avoid frosty or very hot weather if possible. Be careful to use a perfectly clean knife; do not use the knife for other purposes without first thoroughly cleansing it: a clean

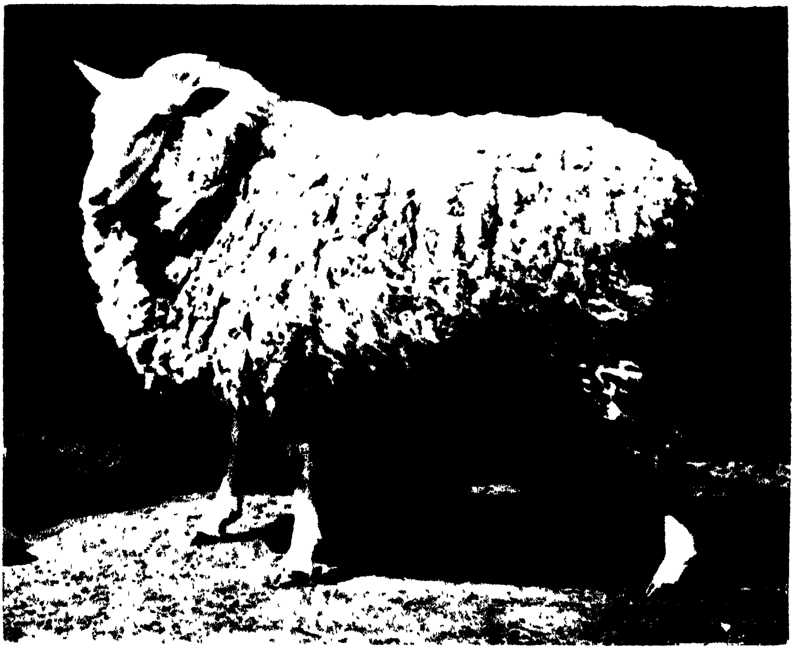
Border-Leicester Ram.
Glen Innes Experimental Farm.

wound in the scrotum heals quickly, while if any dirt is introduced on the blade suppuration may supervene and delay healing, and consequently check growth.

Percentage of Lambs.—Taking for example pure-bred Merino sheep producing 75 per cent. of lambs, the average British ram on Merino ewes would give perhaps 5 per cent. more, or 80 per cent. The British ram on a cross-bred (British ram on Merino ewe) would be about 10 per cent. more, or 90 per cent.; while several of the British breeds (pure) would go from 100 to 130 per cent.

The ewe has no doubt much more to do with the production of twins and triplets than the ram.

Food during rearing of Lambs.—It is most important that the ewes and lambs should have continuous good feed or a check may occur, which more or less defeats the object of early maturing lamb raising. Something more than natural herbage is required. Good cultivated grasses such as Rye, Kentucky Blue, Prairie, and the like must be provided. Lucerne for spring and summer topping, and Rape for the winter, are hard to beat.



Champion Border-Leicester Ewe.
Glen Innes Experimental Farm.

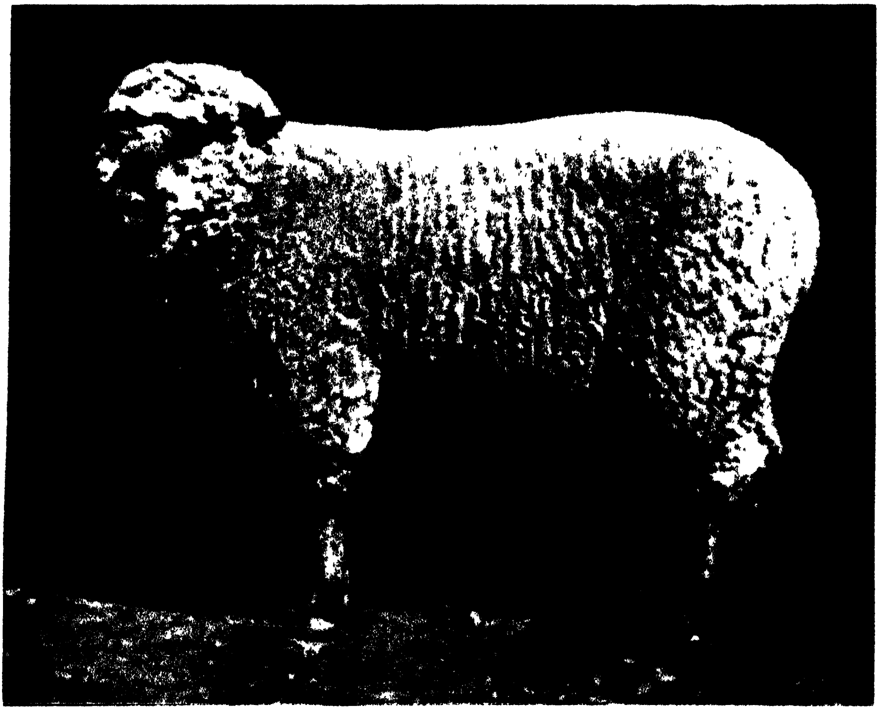
Care must be taken, however, in putting sheep with empty stomachs on these two latter fodder-plants for the first time, or hoven may result. Neither should they be put on on windy and wet days at first. Rye, tares, young wheat and oats may also be fed with advantage.

Cross-breds for fat lambs are essentially the sheep for the small farmer; because his area is limited, he must part with his increase quickly. The cross-bred adapts itself to home conditions readily, will eat off the weeds and manure the land. However, close fences must be provided, as British sheep possess the faculty of going through and under fences to a marked degree.

Advantages and Disadvantages of Crosses.

Lincoln-Merino Cross.—The Lincoln has proved an excellent sheep for crossing with the Merino. The wool in the cross-bred is excellent; the length of staple and lustre giving it great value. The mutton, somewhat coarse in the Lincoln, is improved in the cross-bred by the Merino strain. They do not stand droughty conditions well, and must have abundance of feed. They are not exempt from foot-rot.

English Leicester-Merino Cross.—The English Leicester is one of the oldest breeds, and has been used in England with great effect in the im-

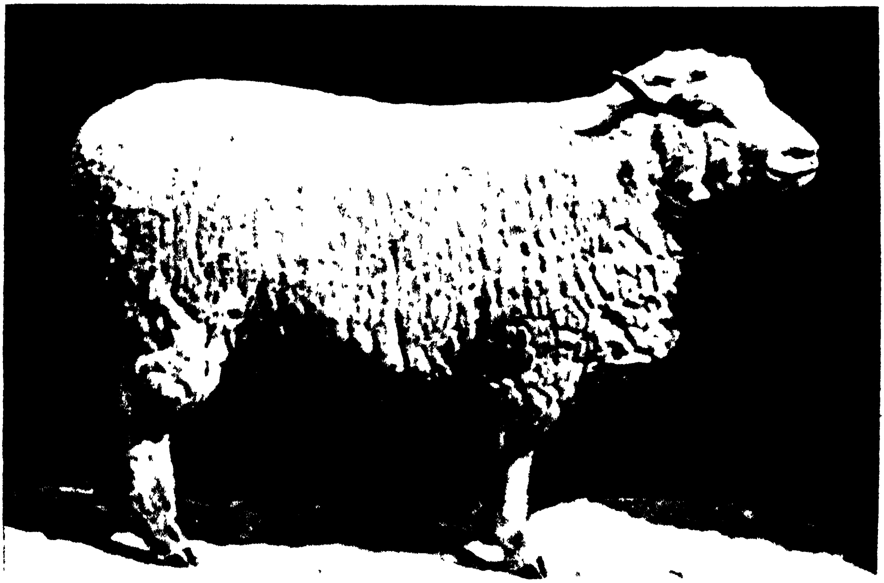


Shropshire Ram.
Glen Innes Experimental Farm.

provement of other breeds. The cross with the Merino is much fancied, and no doubt is coming rapidly to the fore again for crossing with the Merino—the cross-bred possessing a shapely carcass, with mutton of splendid colour, with a fleece of fine useful lustrous wool.

The English Leicester, however, must have rich pastures to thrive on, not being adapted to drought and hardship, and not exempt from foot-rot. The small fine head in the ram is a great advantage when crossing with a smaller sheep.

The Border Leicester-Merino Cross.—The Border Leicester is a bigger and heavier sheep than the English Leicester. More leggy, with a lighter middle piece; active, sprightly, and hardy, being able to thrive much better than the foregoing sheep on scant pastures, and suits hilly country well. The cross produces a fine mutton sheep, which will suit many conditions of soil and climate. Lambs mature early. The head is long, aquiline, and narrow; the sharp protuberance of the eye-cap bone may do some injury to the uterus in lambing, otherwise there is not much difficulty during parturition.



Southdown Ram.

Glen Innes Experimental Farm. First prize, N.S.W. Sheepbreeders' Association Show, Sydney, 1906

The Romney Marsh-Merino Cross.—The Romney Marsh is a large, heavy sheep with wool of medium lustre, which, when crossed with a fairly fine Merino, produces wool of much value; also a good mutton sheep, and produces good fat lambs. No country, except the desert, should be without the Romney Marsh, for it thrives where others cannot exist, viz., in the low swampy country—as well as the hilly country—where fluke and foot-rot abound. The constitution that enables this breed to resist these terrible scourges will make the Romney Marsh breed invaluable wherever these diseases are found.

The Shropshire-Merino Cross.—The Shropshire is getting to be a well-known sheep for mutton purposes, and the wool has been much improved

of late years. A shapely sheep, with good mutton and early-maturing qualities, he is always to be reckoned with. The rams, however, if fat, get very lazy and slow to work, and a good deal of difficulty is experienced with the ewes during lambing from Merinos, as the head is large. The Shropshire belongs to the Downs or Black-faced sheep. A good cross with the Merino—the wool is much improved thereby.

The Southdown-Merino Cross.—The Southdown is a true mutton sheep, not so heavy as the Shropshire or the Suffolk, but is unsurpassed for the quality and flavour of its mutton. A well-bred Southdown forms the model for mutton sheep; it crosses well with the Merino, and the lambs

Suffolk Ram.
Glen Innes Experimental Farm.

mature early, and are much sought after by the butcher. The wool, however, of the Southdown is somewhat harsh, is light and short, but becomes much softer and better when crossed with the Merino. The breed is hardy and sprightly, but not exempt from foot-rot. The head is small, and gives the Merino ewe little or no trouble during parturition.

The Suffolk-Merino Cross.—Last, but by no means least, is the Suffolk sheep for crossing purposes; the lambs from this cross are among the heaviest of all the cross-breeds.

The Suffolk cannot be said to be a handsome sheep; but he does weigh. The wethers from this cross with Merinos also attain a great weight and size.

The fleece of the pure-bred is a fair wool only; but in the cross with a fairly fine Merino the improvement is wonderful, and experts pronounce it to be one of the best of the Downs half-breds yet produced. The Suffolk is a big long sheep, with large black bare head and legs; the mutton is good, fat and lean being well mixed. The ewes are good milkers, therefore good mothers. It has been found at 3 months old that the Lincoln ram on Suffolk-Merino ewes produced weights greater than the Suffolk ram on Lincoln-Merino ewes, no doubt on account of the ewes of the former cross being better milkers than the latter cross; although the Suffolk ram used was much heavier than the Lincoln ram used. Again, the lambs of the former cross were superior in wool, owing to the prepotency of the Lincoln sire. Thus, the same crosses used in different ways produce different results

A mutton sheep should possess weight, shape, and quality of meat; attaining the weights required at an early age, is what pays.

Lambs as suckers at 4 months weigh, say, 35 lb. Wethers at 14 months weigh, say, 56 lb., or according to requirements of the the trade.

All the crosses before mentioned are good; the thing is, for which is there the best demand at the time of breeding? Also the breed must be suitable to climate, soil, and other environments "What thrives best generally pays best."

Breeding Comebacks.

Merino Comebacks.—If comeback sheep are to be bred for wool, the most convenient and best plan is to put the British long wool on to Merino ewes, then a Merino ram on to the progeny.

British Comebacks for Mutton.—If comebacks are being bred chiefly for mutton, put the British short-wool ram or long-wool ram on Merino ewe, and the same class of British ram on to their progeny.

In the above cases, of course, the Merino being the sheep most easily procurable, is used as the dam to commence with.

Flax.

J. LINTOTT TAYLOR.

It will be readily acknowledged by all who consider the importance and value of this article of commerce, that the cultivation of flax ought to become of leading importance in the Commonwealth, for it is almost impossible to over-estimate the worth of a sound flourishing industry on the substantial basis of an ever-increasing demand for a staple article of universal consumption.

Of one item alone, as a product of the flax plant—that of linen thread—Australia imports about £33,000 worth annually; and we may well pause and ask: "Why not produce all, or at least a large portion, of that linen thread within our own States?" The value of the finished article in all the many forms of linen we cannot here state; perhaps Federal returns will show; but the "fine linen" of the old countries is, perhaps, beyond us at present—not in the material but in the manufacture. This need not hinder anyone, in a suitable locality, growing the flax and treating it into fibre, which fibre is much sought after and required for matting, string, twine, binder-twine, and many other articles of daily need.

The writer of this article received from Messrs. J Miller & Co., of Melbourne, a letter dated 29th January this year, relating to this very matter. The following is an extract. "Fibre.—We are very large users of flax fibre, and see no immediate chance of a larger quantity being produced than we ourselves can use. . . . . If you can grow it to give the results you indicate in your letter, there is nothing to prevent this article being a most satisfactory line of export. On all sides they are crying out for fresh fields for the production of flax. The pressing call for this article for manufacturing purposes clearly points to the fact that anything like over-production is practically impossible."

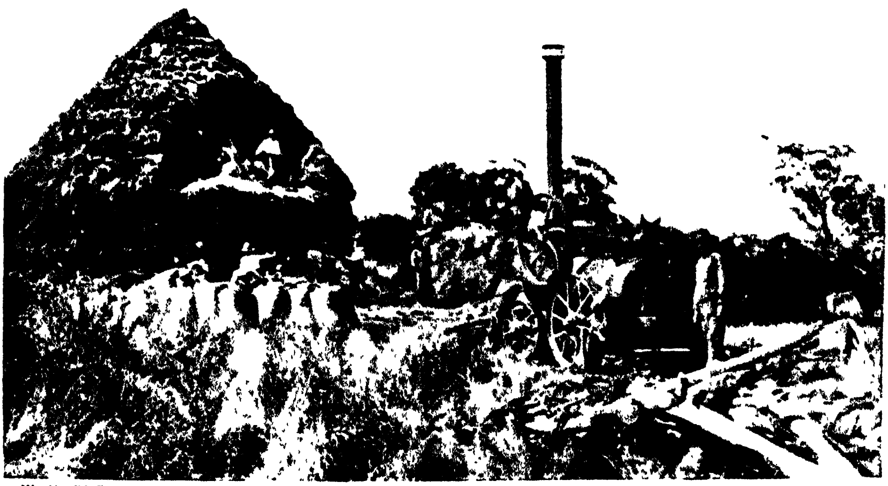
Flax has been successfully grown in Victoria, and that State, with New South Wales and Tasmania, are, in some certain parts, well adapted to produce a good article in quality of fibre and seed. What caused failure in the early experiments made, was the fact that the treatment was the same as that which obtains in the old lands and European countries. Even now the writer meets continually with the assertion: "You cannot save the seed and the fibre from the same crop," or, "You must have running water to ret the flax," or "You must hand-pull the flax, or the fibre will be of no value," and many more equally absurd statements. Of course, for treating into linen fibre, a more careful process must be taken than for treating into fibre for twine; but we are not to that stage yet, and the process of treatment now for fibre for twine, &c., is much

simpler and easier than for the other and finer article. No one, considering the unsatisfactory conditions of labour, would attempt the cultivation of flax on old-world ways and methods; but still, even for a coarser fibre, the growing and treating of the flax may be made to pay very handsomely, and a market is always at hand, and demand unlimited.

Flax is known botanically as *Linum usitatissimum*. It is a wiry, erect-stemmed annual. It is largely cultivated in Ireland and Russia, although it is grown to some extent in England and other European countries. Large quantities of the seeds are imported into England from the Baltic and Black Seas, for the purpose of crushing, from which linseed oil is obtained. The compressed refuse of the seeds forms oil-cake, used for feeding cattle: and the crushed and ground seeds form linseed meal, used for poultices. Linseed oil is a most important product, being largely used in the preparation of paint, as it belongs to the class of oils known as drying oils.

Flax from which linen is made must not be confounded with New Zealand flax, *Phormium tenax*, which belongs to the lily family, also used for making rope and binder-twine.

Now, with regard to the mode of procedure for sowing and harvesting the flax, a few remarks may not be out of place.



W. H BURSTLE, ORANGE, PHOTO.

Threshing Flax at Carinya, Orange.

The first consideration is climate. Flax will thrive in cold, wet climates; frost and snow will do it good rather than harm. At the same time, the soil must be sound, sweet, and good, well drained, and friable, not heavy, swampy, and clayey; though a fine soil with clay subsoil, if not too near the surface, say 8 or 10 inches below the surface, will do well, the clay holding the moisture and yet not near enough to cramp

or chill the roots, which go down from 3 to 7 inches—average 5 inches. Climate and soil being suitable, the proper cultivation of the soil is the next most important feature. The land must be clean. This is an axiom in flax-growing. Not that the plant will not grow, but because it causes so much trouble to separate weeds and fibre later on, and, except for the seed, the crop is of little or no value. The ground cannot be over-cultivated, not only with the plough, but with the finer implements in use on a farm. Long weeds, such as Black Oats, Fat-hen, Camomile, Dock, and kindred weeds, are worse than low ground weeds, since the former are cut and bound up with the flax in the stocks and stack. Seeing the land is properly prepared, it would be well to lightly roll the surface, so as to prevent any of the fine seed sinking too deeply into the open ground left after harrowing. Of course, if the soil is very light, loamy, and friable, this rolling may not be needed till after sowing. To assist the seed in making a strong start, which is of great importance, it would be well to spread lightly some artificial manure; about 6s. cost per acre will be sufficient outlay for manure. Too much of the artificial feeding of the plant by means of these manures will tend to too strongly develop the straw and produce a coarse fibre, such manures, if used, being for the purpose of starting the young plants, and not so much for a continued sustaining. If the soil be good, no manure will be used. The samples grown by the writer, and exhibited at the late Royal Agricultural Show in Sydney, were grown without any manure, and on ill-prepared land. The manure, if used, ought to be sown with the seed, either in drills or broadcast.

We now come to the sowing of the seed. The best time for sowing in a climate such as Orange is during the months of March and April; later may prove successful, but a certain amount of risk is incurred. Linseed is a small slippery seed, difficult to hold in the hand on account of its highly glossy, polished skin, and therefore rather difficult to sow, if by the hand. However, if mixed with a little fine soil, sifted and clean, or some manure, as above named, with a little practice the seed can be very evenly distributed, as was proved in a 60-acre paddock, hand-sown, on the writer's property—"Carinya," near Orange. For the purpose of producing the dual crop of seed and fibre, sowing broadcast has the advantage over the drill, because there is not the liability to stool that often occurs in the drill-sown seed. Then, again, the ground being more generally covered, the roots are not likely to be so exposed to the direct influence of the sun, while the ground is sufficiently warmed.

If the drill is used, it must be set very shallow, and should manure be employed it can be thoroughly mixed with the seed in the seed-box. The use of the drill has this great advantage that, until nearly full-grown and in seed boles, anyone with care can walk between the rows and hand-pull the more strongly growing and dangerous weeds. This cannot be done in broadcast fields, owing to the breaking down of many of the growing plants. The grower must use his judgment in the matter of sowing.

The quantity of seed to be sown to the acre varies according to the purpose for which the crop will be grown, *i.e.*, either for fibre or seed, or for both fibre and seed. If the seed sown is chiefly for seed, then drilling in would be best at about 45 lb. or 50 lb. per acre, or on rich soil even 40 lb. will do well. This allows the heads plenty of room to form and spread. The writer has on one stalk 129 boles, with an average of ten seeds in each bole. Thus, one seed produced 1,290 seeds. This, he believes, constitutes a record. This stalk was found growing all alone, and did not reach over 2 feet in height. This will illustrate that to grow for seed, the sowing must be thin. For fibre and seed, from 56 lb. to 65 lb. ought to yield excellent returns, with good length of staple and fair quantity of seed. For fibre, such as is used in the manufacture of Irish linen, the seed can scarcely be sown too thickly, even up to 100 lb. or more per acre. This sowing will cause the stalks to be very fine and long, and so close as to preclude any expectation of a payable crop of seed; but against this seeming loss of seed there stands the increased value of the fibre. However, this last kind of sowing is practically useless in this State, owing to the want of mills and machinery to treat so fine a staple. It would be too valuable to mix up with coarser fibres for strings or twines.

The most useful crop will be the 56 lb. or 65 lb. per acre, and if it reaches the height of 2 ft. 9 in., or 3 ft., will prove most saleable and meet a waiting market, besides having the seed to the good. Having sown the seed, a light roller run over it to press it in, and then a brush harrow, or a brush harrow alone, will complete this part of the operation. If possible, time the sowing just before rain, or soon after, so that the seed may germinate quickly; and in moist, warm soil this should take place in eight or nine days, and the young shoots quickly spring up, and long tap-roots shoot down and hold on to the moist soil below. The tap-root—as a rule there is only one root—penetrates the soil rapidly, and often a plant, 1 inch above ground, will live on a tap-root 2 or 3 inches below the surface.

The above information will be sufficient to enable anyone to begin and put in a crop; and next month the concluding article will appear. This will treat of gathering, stooking, threshing, stacking, retting, and preparing the fibre for market.

(To be continued.)

Influence of Bees on Crops.

[Continued from page 273.]

ALBERT GALE.

THE essential organs of a flower are somewhat akin to one another, and a cursory glance by a casual observer is more than likely to regard the stigma and anther as similar organs and of equal value in the economy of plant-life. Well, in one sense, they are, just as the sexes in animal life are dependent on one another for the continuance of the species of variety. The dissimilarity in the essential organs in a flower is very marked, and their functions wholly distinct. The anthers are the pollen bearers, and the stigma is the receiver. It is highly important that these distinctions should be studied by all engaged in plant culture; and now, as agriculture and horticulture is so spread over the schools curriculum, the attention of all should be drawn to it.

II. The numbers, or parts, are the same as in Diagram I, but the ovary appears to occupy a different position. In such flowers the ovary is said to be *inferior*—that is, below or without the parts 8 and 9, and whilst the blossom is in bud is *not* enclosed by the floral envelopes. In the early stages of the development of the bud the ovary is always visible. I and II are bisexual or hermaphrodite flowers.

The corolla in many entomophilus plants, *i.e.*, plants pollenised by insects, is frequently of an attractive colour, although some are very inconspicuous in that respect. Its office is, while the flower is in bud, protective, guarding the developing essential organs from injury—acting as a blanket. The corolla is composed of petals; these are frequently detached the one from the other; sometimes they are united at the base, the tips only remaining free.

The calyx is the outer protective envelope. If the corolla acts as a blanket, then the calyx is the macintosh. Like the corolla, it is frequently formed of more than one part. Each separate portion is termed a sepal. It is generally green, but not always.

The beneficial influence of bees on certain crops, and the imperative necessity for their location within a near radius of fruit-trees, demands more than the usual passing glance. The nearer the home of the bee is to the orchard or fruit-garden, the more frequently can they visit the blossoming fruit-trees. The earlier in the morning the bees visit a fruit-tree when in bloom the more certain will be the act of pollenisation and

the resultant fertilisation the more effectual. Bees have been seen on their foraging ground beyond the radius of 3 miles, but these long journeys must be undertaken at the expense of the number of trips made during the day.

Blossoms open at various hours both in the day-time and in the night—the majority in the early morning just after sunrise, some at noon, others in the twilight, and a few species after dark. Some species of flowers are very sensitive to light and darkness, and will only open when the sun shines brightly. Those that open in the earlier portion of the day generally close towards sundown and re-open the following morning,

III. Maize.—A is the parts 5 and 6 or 7, the male or staminate flower shown in Diagram I; and B is the parts 1, 2, and 3, and forms the female or pistillate flower.

especially if they have not been visited by an insect; those that open at twilight or after dark close at dawn. The blossoms of fruit-trees generally remain open the whole day. During a heavy flow of honey, bees will work for some time after sunset and well on towards darkness. On warm, calm evenings I have more than once seen bees returning home by the light of the moon, when the latter has been shining brightly. Of course, diurnal flowers are visited by diurnal insects. Flowers that open in the twilight or after are visited chiefly by moths.

Anemophilus flowers (those that are fertilised by the wind) do not close after they have once opened. The anthers being attached to the filament

so tenderly, the slightest movement caused by a passing breeze is sufficient to shake the pollen to the stigma. It is the soft, gentle breeze that is efficacious in the fertilisation of cereal crops—wind just sufficiently strong to carry the pollen a few feet from the anther that produced it. At the time wheat and other cereal crops are in flower, when the pollen is mature and hanging loosely in the anthers, heavy wind storms are as destructive as late frosts. Many a crop that has appeared promising enough when in blade, has failed to give a heavy yield, owing to strong winds catching up the pollen and wafting it away into the bush, or elsewhere, where its influence is lost.

The arrangement of the reproductive organs in blossoms vary very considerably in different classes of plant life, and the most casual observer must have noticed the many forms of insect life. Those insects that subsist on the honey they extract from flowers are, in many instances, so constructed as to appear to *fit* the flowers they visit. Again, the construction of certain flowers is only adaptable to the wants of certain insects. The nectary is so situated in different classes of flowers that the honey it contains can only be obtained by the insect *designed* to fertilise them. The length of tongue in moths, butterflies, and bees is well known, and its length plays no inconsiderable part in perpetuating varieties and species of the vegetable kingdom. In Darwin's work, "Fertilisation of Orchids"—a book everyone interested in the subject should read—he mentions one flower as having a spur-like form, from 10 to 11 inches long, with the nectary situated at its base, and for the purpose of obtaining the honey contained therein there must be an insect with a tongue of an equal length. It appears that this particular orchid is a native of Madagascar. Some orchid hunters, in searching that island for specimens, came across a moth with a tongue of corresponding length—evidently the agent employed by Nature to fertilise this particular plant. Some plants are only met with in particular localities; in other localities, having the same conditions of soil, warmth, moisture, &c., they are entirely absent. Again, in localities where some species of plants are found, certain species of insects are also to be met with, and *vice versâ*. Thus, particular plants are dependent on certain insects, and particular insects on certain plants, for the propagation of their species.

The pollen-bearing organs are not always to be met with in the same flower. In the melon, cucumber, and other plants belonging to that tribe, some of the flowers are male—*i.e.*, possess stamens only, or have no pistil; while others are female—*i.e.*, possess a pistil but no stamens. The pollen of this tribe of plants is comparatively heavy and viscid. It is therefore obvious, as the two sexual flowers are situated at some distance the one from the other, a foreign agent must convey the pollen from the stamen to the stigma of the pistil of the female flower. In some of the Egyptian palm-trees there are what are termed male and female trees—*i.e.*, the sexual flowers are on separate and distinct trees. The trees are often at considerable distances the one from the other, and the pollen can

only be transported by insects. The variegated laurel (*Aucuba japonica*) is another of these diœcious shrubs, and of course, like the palm-trees referred to, the male and female flowers are on different trees. It was introduced into England many years ago by the Dutch from Japan. It so happened that the plants first introduced were female plants, or in other words bore female flowers only. There were no pollen-bearing flowers, consequently no seed could be produced, and propagation was carried on by cuttings only. Some years afterwards a Mr. Fortune introduced some male plants. These were planted in close proximity to some of the old Dutch ones that had been perpetuated by means of cuttings. The result was that an abundance of fertile seed was produced the following season.

The pollen of the variegated laurel was an article of commerce in the London Covent Garden market.

The length of time the pollen of some of the palms and laurels retain their vitality is remarkable. The pollen in other varieties of plants must be utilised soon after it is discharged from the anther or its procreative property is lost.

The quantity of pollen grains discharged from flowers is something enormous, especially in those plants where the sexual flowers are on different trees. The flowers on a Chinese laburnum (*Wistaria chinensis*) were calculated to contain no less than twenty-seven billions of pollen grains.

From these illustrations it will be noted the utter impossibility for certain plants to be perpetuated from seeds, or to produce fruit, without aid from an agent outside themselves. Here the bee comes in to play its important part in our fruit-crops.

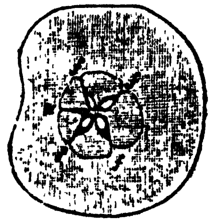
What I have said in relation to the distribution of the sexual flowers in the variegated laurel, palms, &c., is equally true and holds good in the blossoms of our orchard fruits, with this exception—that they have not separate sexual flowers, but the sexual organs are in one and the same flower. Notwithstanding this, the stamens mature, and the pollen is distributed some time (in some cases days) before the pistil, or rather the stigma, is sufficiently developed to receive it. Thus, while the male organs of some of the flowers have perfected, maturition in others is still progressing, and so with the pistil; so that the fertilisation of the fruit blossom by its own pollen is as impossible as if the reproductive organs were on different plants, or at least on different flowers on the same tree; therefore a foreign agent is as essential to transport the pollen from hermaphrodite flowers as from that of diœcious. The oft-quoted aphorism, "Nature abhors a vacuum," was reconstructed by Darwin into "Nature abhors perpetual self-fertilisation"; and the various ways Nature has arranged the pollen-bearing organs is Nature's safeguard against what is termed in-and-in reproduction, and cross-pollenation ensured. Cross-pollenation has long been recognised in the economy of the reproduction of members of the vegetable kingdom. It was known as far back as the

time of Herodotus. He describes the process of the transference (caprification) of the pollen from the male tree to that of the female, by which means a crop of dates was ensured on the Egyptian palms.

Some early-blossoming trees seem to burst forth suddenly, especially pears. In looking through a truss or a bunch of pear blossoms on the same stem that have just opened, it will be noted that the parts perfected are the calyx, the corolla, and the stamens. The pistils are still undeveloped. After the anthers have discharged their pollen, the ripening of the pistils commences; and by the time the stigma is receptive, there is no pollen from the first opening blooms wherewith these early-maturing blossoms can be fertilised. It is obvious that the all-important pollen must be obtained from some other flowers, or there will be a failure in the crop of the tree that has so blossomed. I shall point out further on that the pollen from any source, if the bees were to convey it, will be as great a failure as if the stigma were entirely deprived of that fertilising influence. Seeds must be fertilised by pollen from their own species. A newspaper clipping—I think from a Brisbane paper that I have now in my possession—says: "If one were to plant 20 acres with Stone Pippin apples, or with Cleopatras, or with Duchess pears, and no other kind of apples or pears within a half-mile, it is not at all likely that there would be any fruit. *(If there were trees within the radius of half a mile, the experiment would not be a failure; if bees were within 2 or 3 miles they would carry the pollen, but the crop would be light.)* It is necessary to have a few of some other variety of apple or pear, which bears blossoms at the same, *or about the same, time*, and then they will pollenate each other, so that both varieties will bear fruit. Bartlett pears are fertilised by Duchess d'Augoulême, Easter Beurré, Beurré d'Anjou, and by others. The thing required is to have the flowers of each variety mature at *nearly* the same time. There is at least one instance in this State where a large block of apples of one kind has been planted for many years, and has never borne any fruit, although the trees are very strong and healthy, and bear perfect flowers every year. The pollen is ripe before the pistils are ready to receive it, and by the time the pistils are mature the pollen is all gone." The *italics* in this quotation are mine. I once read in an American paper a similar failure in connection with cherry orchards, where the bees had all been removed because they were accredited with eating holes in the ripe fruit, and thus reducing their market value. After the removal of the bees from the district the trees gave no, or at the most but a slight, crop of fruit. After about three years, the bees were returned to that district, and the trees went on bearing as heretofore. With ignorant men, the poor little bees get the credit of a host of evils they never do. If all orchardists knew the value of bees, apart from that of honey producing, no orchard would be seen without them.

Every grain of seed requires a grain of pollen to fertilise it. By removing the husks from a corn-cob whilst in a green state, a fine silken

thread will be seen attached to each maturing grain. It is the organ of reception, and it is absolutely imperative for a grain of the dust from the anther (the flower on the top of the corn-stalk) to fall or be conveyed to the point (stigma) of each silken thread. In a mature cob of corn, misses in the rows of grain are often observable. This is caused by the pistil not having received its necessary grain of pollen; and caused either by an injury to its stigma or an insufficiency of pollen. Deformed fruits are of common occurrence, more especially with apples and pears. This is caused by imperfect pollenisation. It is clearly observable in the accompanying diagram: a section of an apple showing the five sections of the ovary, with four of the ovules of seeds, marked *f*, perfectly fertilised, and on the sides of the fruit, where the seeds are so fertilised, it is perfect in form. The unfertilised seed in the ovary, marked *u*, has caused the deformation in the fruit. If, in four out of the five sections seen in the ovary of apples and pears, the seeds therein are perfectly fertilised, the fruit is likely to develop, although it will be a deformity; but if only three be so fertilised the fruit seldom comes to perfection. The light seeds, those without kernels, that are frequently met with in pumpkins and other members of that family, are caused in a similar way—*i.e.*, by the bees being prevented by some cause from supplying a sufficiency of pollen to do the whole work necessary in reproduction.



The matrimonial ceremonies—how they marry and are given in marriage—is the portion of the subject I here wish to deal with. The arrangements of the sexual reproductive organs and their various functions have already been dealt with.

There is nothing more interesting in the life-history of the vegetable kingdom than the methods and agencies of its reproduction. Fascinating as it is, it is too often the stumbling-block of amateurs, whose love of plant-life carries them to look into the deeply-hidden mysteries of this absorbing subject. The sexuality known to exist in blossoms, their matrimonial instincts, their marriage ceremonies, their domestic ties, their methods of raising and perpetuating their families and co-relations, the officiating and conjugating priests, and the agreement between the contracting parties, are all more or less like fairy tales than actual facts.

(To be continued.)

Soil Surveys.

F. B. GUTHRIE.

[Read before the Agricultural Section of the Australasian Association for the Advancement of Science, Adelaide, January, 1907.]

The present position of Soil Analysis.

RECENT developments in the study of the soil have resulted in establishing soil-analysis and the interpretation of the results of soil-analysis upon a more secure and satisfactory footing than in the past. As a consequence of the knowledge thus gained into the nature and functions of the soil constituents, soil-analysis is able to take its proper place as part of the work of the chemist which is of direct and practical benefit to the farmer.

In a paper on "Soil-analysis," which I read before this association at its Brisbane session in 1895, I expressed my views regarding the function of soil-analysis and the lines along which it was most likely to be of practical benefit. At the time there was considerable diversity of opinion as to the value of such analyses, and this was undoubtedly due to the fact that soil-analysis, as then carried out, concerned itself almost exclusively with determining the percentage amounts of the chemical ingredients, a course which was frequently misleading, and which was seldom of much practical value. If I were reading such a paper to you to-day it would be unnecessary to adopt the somewhat apologetic tone which dominates that address; for properly conducted analysis of the soil is now recognised as affording the only trustworthy data on which to base a judgment as to the agricultural capabilities of any soil, and the best methods of treatment.

For this more satisfactory position of affairs we have to thank those whose labours have afforded us a clearer conception as to what is meant by soil fertility, and a better knowledge concerning the factors which conduce to fertility. It is to the advance of knowledge along three lines in particular, that we are indebted for our present more rational view of the functions of soil-analysis. In the first place the study of soil physics has disposed for ever of the idea that the fertility of the soil can be gauged solely by determining the amount of chemical plant-food present in the soil.

We know how all-important is the question of the texture of the soil, how great the influence of the actual size of the constituent particles upon the obscure changes—chemical, physical, and biological—which are in constant operation within the soil. An analysis of the soil, which takes account only of the proportion of the chemical constituents, is now recognised as useless; it is indeed worse than useless, for, being frequently

absolutely and palpably misleading, it only serves to cast discredit upon the chemist's endeavours to assist the farmer. The development of soil-bacteriology has been a further powerful factor in giving us a more rational view of soil-fertility. We know how important a factor in determining fertility is the nitrifying power of the soil. We are learning something more of the conditions which are favourable to nitrification, and how these may be maintained. We know how intimate is the relation between the physical condition of a soil and its power of promoting nitrification. It is true that we still lack a direct and trustworthy method for determining this property, and for expressing the nitrifying power in definite and comparable terms; but we may hope to be in possession of a workable method before long.

Finally, the third potent factor in rationalising our views on soil-chemistry is the recognition of the importance of a knowledge of the condition in which the plant-food is present, and the extent to which it is immediately or finally available to the plant.

We recognise that it is of less importance to know the actual amounts of plant-food present in the soil than to know how much of it is immediately available for the needs of plants, and that it is of still greater importance to know the power possessed by the soil of rendering the plant-food available.

Soil Survey of Australasia.

My object, however, in this paper is not to discuss the benefits of soil-analysis, but to offer for your consideration and discussion the question as to the best means for carrying out a systematic examination of the soils of Australasia, on the lines on which such work is being carried out in other countries, or with such modifications as may be found most suitable to our conditions.

I need not do more than merely refer to the great undertaking of the United States Bureau of Soils, which is engaged in the preparation of a surface-map of the whole of the States, a stupendous undertaking, which it will take many years to complete.

The Governments of Belgium, France, and Germany are all engaged in the same work; and I think the time has come to bring under the notice of our authorities the importance of carrying out such an investigation locally. Before doing so, it is desirable to have some fairly cut-and-dried scheme to lay before them; and it is in the hopes of provoking discussion and eliciting an expression of opinion on the matter from those competent to deal with it that I venture to lay my views before this meeting. I am in hopes that such a discussion will result in our being able to formulate a workable scheme of operations.

It is not only in the better knowledge of the soils over any given area, their possibilities and requirements, that the benefit of such a survey would consist, but in the opportunity that would be afforded of investigating systematically many unsolved problems connected with soil-treatment.

Soil Analysis for Farmers.

In New South Wales, and I believe in the other States, a very large number of soils are examined every year for individual farmers. The results of these analyses are of benefit only to the person for whom they are performed, for it is very seldom that the samples received in this way are typical of any large area. In a very large number of cases the sample represents an exceptional state of things—a sour or scoured patch, or an area from which unsatisfactory results have been obtained. In some cases the samples are of virgin land, and in others, from cultivated areas. It is necessary therefore to have examined a very considerable number of soils from the same locality before it is possible to determine the type of soil characteristic of the area and the extent to which it varies. This is a point of very great importance; and the absence of knowledge as to the nature of the typical soil of the district often makes it difficult to judge accurately of the requirements of the soil under examination, because it is important to know, not only the constitution of any given soil, but also in what respects it differs from the type-soil.

The analysis of soils for individual farmers is, in my opinion, an undertaking of the greatest value. We are able, not only to suggest improved methods of soil-treatment as the result of analysis, and to afford advice as to suitable crops, but we are able to help the farmer in solving many problems which may have puzzled him in connection with his soil. Of equal, if not of even greater benefit, is the opportunity which is afforded the Department of getting into intimate touch with the farmer to their mutual benefit.

A soil-survey would not replace, but would supplement the analyses of soils for individuals. When once well in operation it would considerably lessen the labour involved in the examination of individual samples, since after a given area had been surveyed, any soils taken from it could be referred at once to one or other of the types peculiar to that area.

Objects of a Soil Survey.

The problems to be elucidated by a soil-survey differ somewhat from those presented by the examination of farmers' samples.

The object of a soil-survey is to ascertain the general character of the soils over any given area; to prepare a surface-map showing the distribution of the various soils, and the localities where they deviate from the prevailing types; and to note peculiarities as to climate, surroundings, &c., which would affect agriculture.

Field Operations.

The first essential in the survey of any given area would be the classification of the soils under different types, and their classification would be based on their physical nature.

Samples of soils representative of these types and their subsoils would be collected for more careful examination in the laboratory. At the same time, the depth of the surface-soils and any variation in their depth would be noted and marked on the map.

This classification could be made roughly on the spot. The distribution of these types and of the different soils over the area would then be marked on the map. The scale adopted by the United States survey is 1 inch to the mile; and a preliminary desideratum is the possession of maps drawn to this scale, on which all the important topographical features are shown.

The soil-map would show, in the first place, the distribution of the typical soils, and in the second, any deviation from these types, either in the nature of a different soil formed by the disintegration of a vein of different rock, stony patches, rocky ridges or gullies, meadow land, along streams, heavy timber, &c. In addition to the preparation of the map and the collection of samples of surface and subsoil for analysis, the surveyor would note all the surrounding features which throw light upon the nature of the soil for agricultural purposes, or which would affect farming conditions, such as the nature of the trees and herbage, distance to ground-water, rainfall, temperature, &c. In the conduct of such a survey, the points to be especially kept in mind are the necessity for rapidity as well as accuracy both in the field operations and in the laboratory, the proper equipment of small parties for the field work, uniformity of classification, of mapping, of taking samples, and of methods of analysis.

With regard to the actual details of work in the field, I am inclined to the opinion that the field operations should be confined to the taking of samples; borings to ascertain the nature and depth of the subsoils; a rough classification of the soils; the preparation of the map and the taking of notes of surrounding features. The conditions of travelling over the greater part of the Australian bush are not such as render it desirable to burden oneself with any unnecessary impedimenta. The sampling tools, soil samples, and maps are a quite sufficient load to carry during a long day's ride.

Laboratory Work.

In the laboratory more detailed examination of the samples would be carried out. I do not propose to enter into detail here as to the methods to be adopted or the determination to be made. Methods for soil-analysis which are considered suitable for our conditions have been elaborated by the Association of Agricultural Chemists of Australasia. These are intended primarily for examination of farmers' samples, and, with very slight modifications, could be made to serve the purposes of a soil survey. This is a matter which will receive attention at the next meeting of the Association.

The point to which I desire to draw particular attention in this place is that greater attention should be given to the determination of those

properties which depend upon the physical nature and texture of the soil than upon a purely chemical analysis, which latter should occupy quite a subordinate position. Attention should be especially directed to the determination of such properties as the capillarity of the soil, its retentive and absorptive powers, the size of its component particles as determined by sieving and elutriation, and the general relation of the soil towards moisture and heat.

The purely chemical part of the analysis should be confined to determination of the humus, total nitrogen, and the proportions of lime, potash, and phosphoric acid soluble in hydrochloric acid as a general rule. In special cases other soil-solvents would be employed, and in others, special ingredients would have to be determined. A determination of the rate at which nitrification proceeds in the different soils is also of the greatest importance; and the attention of chemists is drawn to the great need for devising some trustworthy method capable of giving uniform and comparable results for determining the nitrifying power of soils, for this, more than any other property, affords an index as to the fertility of the soil. In the absence of any method sufficiently well established to be made official, the method worked out by S. F. Ashby (J.C.S., 1904, 85, p. 1158), or the oxidation method of E. J. Russell (J. Agric. Science, I, Oct., 1905, p. 261), may be provisionally adopted as affording valuable information. It may be confidently hoped that further elaboration of these methods will result in the establishment of a method applicable in all cases, and which can be made official.

It is important that all the chemical methods adopted, whilst being accurate, should be as rapid as possible, since a very large number of samples will have to be dealt with; and attention is specially invited to the rapid methods devised by the United States Bureau of Soils, to the estimation of the moisture and salt-content in soils, by measuring their electrical resistance, and to the rapid titration methods for the individual fertilising ingredients. These methods should be particularly suitable to our requirements, as they are at once rapid and sufficiently accurate.

Co-operation to be desired.

In order that the work should be carried out to the best advantage, and to ensure uniformity and continuity, it is very desirable that all the States should co-operate. The work might suitably be carried out by the Commonwealth, with branch bureaus or surveying parties in the different States.

The greatest immediate value of such an organisation would be derived from the survey of land which it is proposed to throw open for agricultural holdings. Several such surveys have been carried out in connection with the closer settlement scheme in New South Wales, notably in the cases of the Myall Creek and Dorrigo subdivisions, and the Barren Jack irrigation area. If a soil-survey always preceded the cutting-up of such areas into allotments, the latter operation could be carried out on more

equitable lines than is possible at present, and the size and value of the holdings could be apportioned in accordance with their agricultural value.*

A soil-survey of the whole of Australia would be quite as big an undertaking as the United States one, and would probably take longer to accomplish; but it would be no more formidable than the geological surveys now in operation in the different States, and it need not involve any considerable expenditure. A small field party of two, working in each State, with the assistance of the agricultural laboratories to carry out the analytical work, would soon be able to accomplish valuable results. The value of the work done, both to the farmer already on the land and to the prospective farmer who contemplates taking up land, is not to be calculated. Consider what a mass of information of the first value would be available to the farmer if the whole surface area of one of the States had been mapped out and described in the manner suggested. The nature of the soils and their distribution, their peculiarities, good or bad points, suitability for different crops, the best and most economic treatment for different purposes would all have been more or less accurately determined, and the landowner could at once put the knowledge so gained to practical use without unnecessary waste of time or labour in experimenting.

It is towards such a state of things that a soil-survey would direct its energy, and in the course of the investigation a large amount of work of the highest scientific value would result, which, in its turn, would advance agricultural science and improve the lot of the husbandman.

* In connection with the valuation of lands for purposes of taxation, valuable and interesting information will be found in an article by Professor Hazard, of the Mockern Agricultural Station.—"J. Hazard. Die Geologisch-agronomische Kartierung als Grundlage einer allgemeinen Bonitierung des Bodens." Landwirthsch Jahrbuch, Vol. 29, p. 805.

Butter Classification.

The Scientific Examination of Butter for Export to England and elsewhere.

[Continued from page 227.]

M. A. O'CALLAGHAN.

In March issue of the *Agricultural Gazette* I dealt briefly with the question of butter classification, and more especially with reference to the part which "fishy" butter plays in such classification. Since writing this, I have received several reports from London which go to show the very great necessity for a bacteriological examination of almost all graded butters from time to time, in order to assist the grader in his work.

The New South Wales Government has now in London an agent examining butters, who has the reputation of being a very keen judge; and as his reports come to hand every week, they are compared with graders' reports made on the butter here before shipment. It is pleasing to be able to report that in the generality of cases the Inspector's report in London agrees pretty fully with the graders' reports on this side. An odd instance has occurred in which, as was pointed out in the March issue, a butter showing no signs of fishiness on examination here, developed this trouble on the voyage, and on its arrival in London scored considerably less than when it was graded. As the value of our examination in the laboratory here became more fully understood by the graders, so the number of instances above referred to has decreased, because now, if a grader has any suspicion at all that a butter is likely to go fishy, he takes a sample and submits it for bacteriological examination.

In connection with this matter of fishiness, I might quote from our Inspector's report from London, dated 1st March, in which Mr. Gillanders states:—

> It is satisfactory to be able to report this week that there is less "fishiness" noticeable, and looking at the shipment broadly it may be considered satisfactory. One most encouraging feature is the absence, so far, of any serious comment on any of the brands on the part of importers and merchants.

In this month's list of illustrations I have given but one of "fishy" butter, viz., Illustration No. 16, in which there is seen the mould *Oïdium lactis* in great numbers, as is always the case when the butter is reported "fishy."

For the purposes of contrast, as well as to show how valuable the bacteriological examination is for all butters when properly understood and conducted, illustrations are given of some of our best butters, which were awarded "superfine" on examination. It will be seen that the butters in question, which obtained superfine quality, have no liquefying bacteria

present, and there is nothing shown capable of causing any injurious fermentation. In connection with this it is well to add, when butters are to be examined bacteriologically, it should be done while these butters are new, if the examination is to be relied on as an indication of quality, because when a butter has been decomposed and various fermentations have succeeded one another, it is quite common to find that very few bacteria remain alive.

There have been some complaints regarding the grading of Australian butter (and in one instance there was a suspicion that the butter-boxes had been tampered with), and as a result of these complaints the Home and Foreign Produce Exchange have made an addition to Rule 53 (*b*). This rule formerly stated "that the Government grader's certificate of quality at time of shipment was to be final," and the addition now made runs as follows: "unless in the opinion of the buyer some error has occurred in the grading, in which case the buyer shall have the option of submitting the matter to arbitration." With the advent of three or four States coming on the scene at once grading butter, and the grading being carried out by men not accustomed to awarding points, it is only natural to expect that some differences of opinion would exist, and therefore the addition to Rule 53 was quite to be expected, because it would be ridiculous to hold the buyer to a contract when there was absolute evidence that a mistake had occurred. This addition will make it more difficult to sell f.o.b. Sydney, and therefore greater necessity than ever exists for the keenest and strictest grading to be carried out. When the market is against buyers, or, in other words, when a man buys in Sydney on a good market and sells in London on a flat one, there will always be the tendency, inseparable from human nature, for the buyer to endeavour to lessen his losses, and should the quality of the article on arrival in London be the least bit inferior to what it was graded, there is no doubt the buyers will take advantage of the additional clause in Rule 53.

On the other hand, when the market in London is firm and sales are passing off quickly, some errors or differences of opinion in grading will not be mentioned. The grader should, however, always work on the one basis, irrespective of market considerations, and he should protect his judgment, or rather help it, by having samples examined bacteriologically of the various factories coming under his notice, every now and then. Apart from this, chemical examination of the butter should be made, and is made in this State, whenever a butter exhibits anything unusual in the shape of moisture, preservative, or casein; and we have been able to protect the reputation of New South Wales butters in several instances since the Commerce Act was put in force, by preventing the shipment of butters containing undue percentages of water. We have had creamery butters offered for shipment containing as high as 24 per cent. of water, and, needless to say, the presence of such butters in London would materially affect the reputation of the butter of this State, especially if samples should be taken by the English authorities for the purpose of

analysis. A year ago if anybody suggested that butter containing over 20 per cent. of water was being manufactured by any Australian butter factories, the idea would be ridiculed; and whereas it is pleasing to be able to report that the bulk of the butter submitted for export is very low in moisture, the best brands not showing more than about 12½ per cent., still it must be pointed out, and brought home to the factories concerned, that the manufacture of watery butter for sale, either in Sydney or in London, should be stopped. No doubt butter containing these high percentages of water are only made in small and badly-equipped factories; but it will now be impossible for these manufacturers to export such goods, and it is expected next season we shall not have records of anything of this sort.

Standards for First Quality and for Superfine.

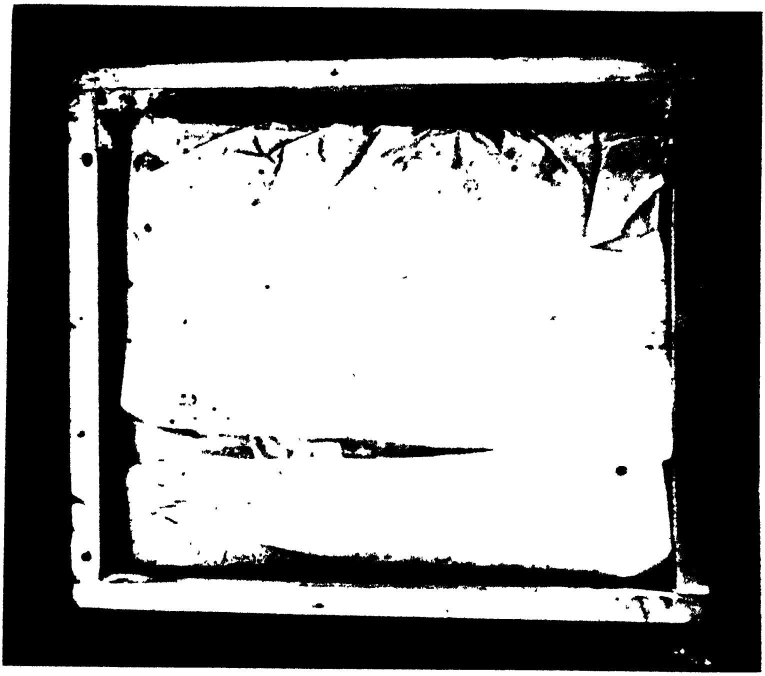
Complaints are made by London houses that graded first quality butter sometimes is not, according to their opinion, first-class, and they add that a butter scoring, say, 88 to 86 points, should not be admitted to first-class. In connection with this, it will be interesting to quote from a letter received from our London Inspector, Mr. Gillanders, viz.:—

> Occasionally I hear comments about the grading not being all that could be desired, as naturally, under the present system, buyers on c.i.f. terms have to pay just the same price for butters grading, say, 86 to 88 points, as for butters grading from 90 to 93 points, say on a contract calling for "First-class Pure Creamery," and, naturally, when they come to realise their purchases, there is quite a difference in the prices. . . . .

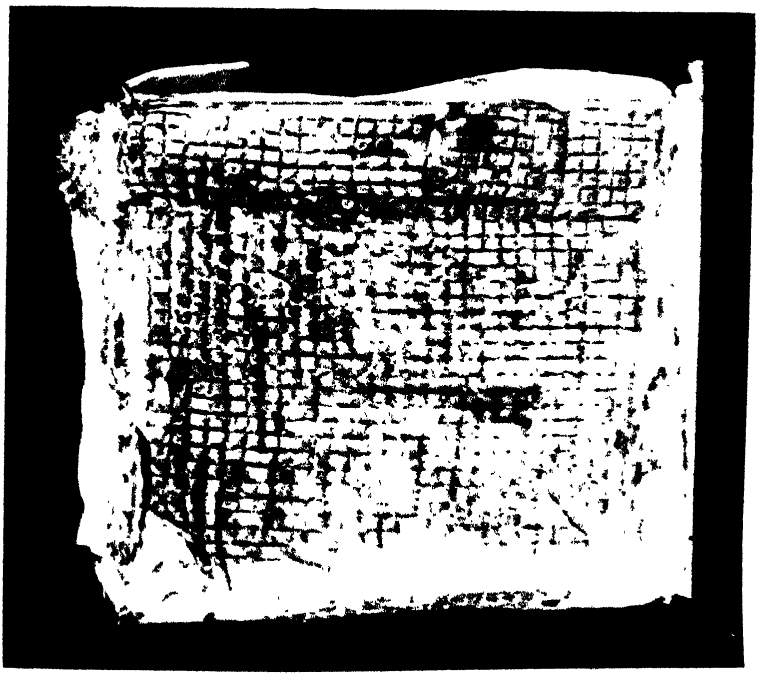
This complaint is really due to a want of knowledge on behalf of the English purchasers of the basis or standard adopted by the Commonwealth in the grading of butter. Those houses represented in Sydney are not likely to have fallen into any error of this kind, because lots of them have been buying on a basis of 90 points and upwards for first-class; and if all the London houses understood the basis as well as these latter, we would have heard very few complaints.

In connection with these standards for the different grades of butter, it must be pointed out that the conference in Sydney drew up these standards on the understanding that the grading of all butter was to be compulsory, and under such a condition it was necessary to adopt a pretty low basis to begin with for ordinary first quality. Otherwise, the outlying factories in new districts, especially in New South Wales and Queensland, would be certain to suffer in reputation until the managers and suppliers of cream got to understand thoroughly the quality of the cream required to manufacture, say, a butter worth 90 points. The Commonwealth Government removed the clause making the grading of butter compulsory, and, therefore, they prevented at once any hardship which may have occurred owing to high standards for first-quality butter being adopted right away. Under the altered condition, if the conference had been called together again, it is very probable that 88 or 90 points would have been adopted as the minimum standard for first-quality butter.

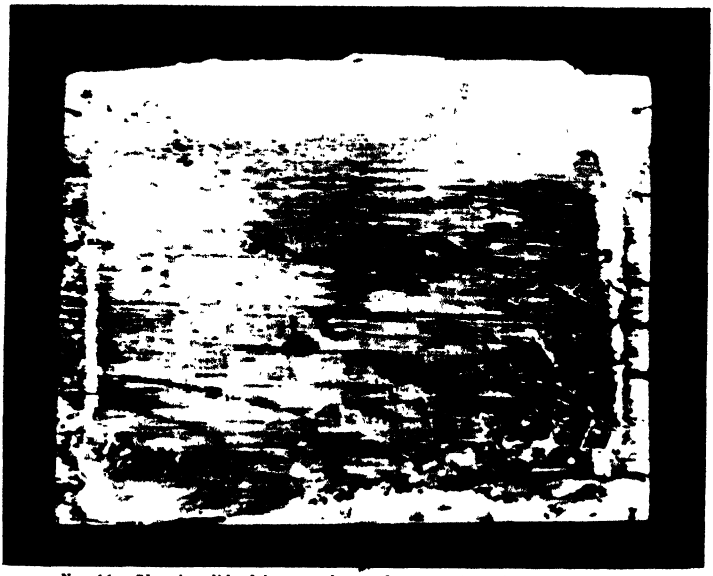
No matter what the margin is between maximum and minimum first quality, there will be always some difference. There will be the one



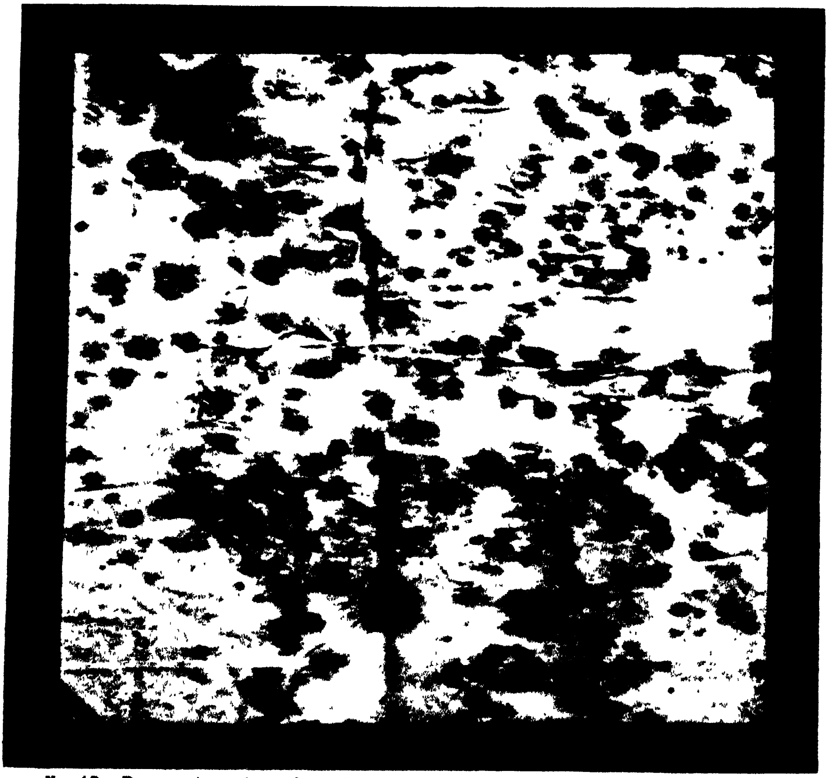
No. 9.—Showing a moist butter which shrank away from sides of box and went mouldy on surface.



No. 10. Showing mould growth on surface of butter when opened. This butter had been delayed in transit.



No. 11.—Showing lid of box (under surface) used on butter referred to in No. 10. The lid is stained by mould growth.



No. 12.—Represents a piece of parchment-paper taken from a box of butter. Observe the numerous colonies of the mould *Penicillium glaucum*.

butter which is just too good for second quality and there will be the other which is just not quite good enough for superfine, and if a man buys a line of a couple of hundred boxes it is probable that he will have included in these both extremes, unless, as used to occur at one time in connection with grading in another country, some shrewd merchant goes over the butters and selects from among all the firsts the very best, and asks a special price for those, handing the others over to the contractor as first quality butter. This of course would deteriorate the work of the grader. We must trust to the shrewdness of the buying public to protect themselves in such matters.

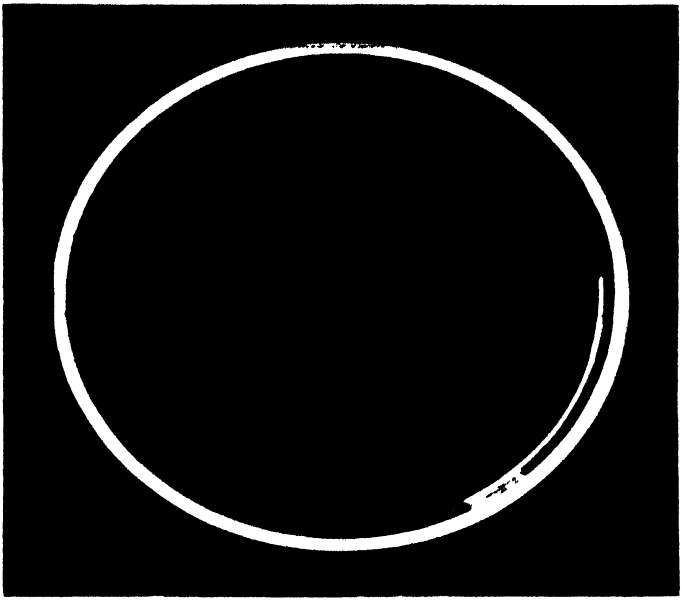
The basis of the minimum number of points for first quality butter may, however, be altered next season, as now the factory managers have been educated to the working of the Commerce Act, and the necessity for grading their cream strictly has been demonstrated. The opinion is held in pretty well all of the States that the minimum for first-quality butter should be 88 points at least, and, personally, I believe that after, say, 1st November, 1907, it would be advantageous to raise this minimum to 90 points. By that time our butters should have improved very considerably, as the grading of the butter will have educated the factory manager and the farmer as to the quality of the cream which will make a butter that will grade for him 88, 90, or any other number of points, and factory managers should be able to draw a line in the grading of their cream between superfine and first quality. However, "Rome was not built in a day," nor can everybody become acquainted with the standards and requirements of grading from such a large area as the Australian Commonwealth in a few months, not to speak of the English merchants who only studied the question from their own point of view. It will be found, I have no doubt, that in a couple of years' time the quality of our butter will have improved all round, and then the English buyer, as well as the local factory manager, will have nothing but good reports regarding the grading of butter and its advantages. Already some of the factories in New South Wales who stoutly opposed grading are the greatest converts thereto. I know one factory, situated in a district that is supposed to have signed various petitions against grading, and to-day this factory is benefiting to the tune of about £30 per week through the introduction of grading. They have been obtaining superfine quality for their butter almost from the inception; the result is that they have been able to get from 2s. to 3s. per cwt. more for their butter than some of their competitors, who get ordinary top-market rates.

There are other things, however, besides the flavour of the butter which affect the price and quality, and an example of this is demonstrated in Illustrations Nos. 9, 10, 11, and 12. Illustration No. 9 represents a box of butter taken from a shipment that was bar-bound on one of our rivers. It is seen that the butter has shrunk away from the sides of the box, and that the paper is somewhat mouldy. Illustration No. 10 shows another box from the same shipment, with the lid removed. Right through the

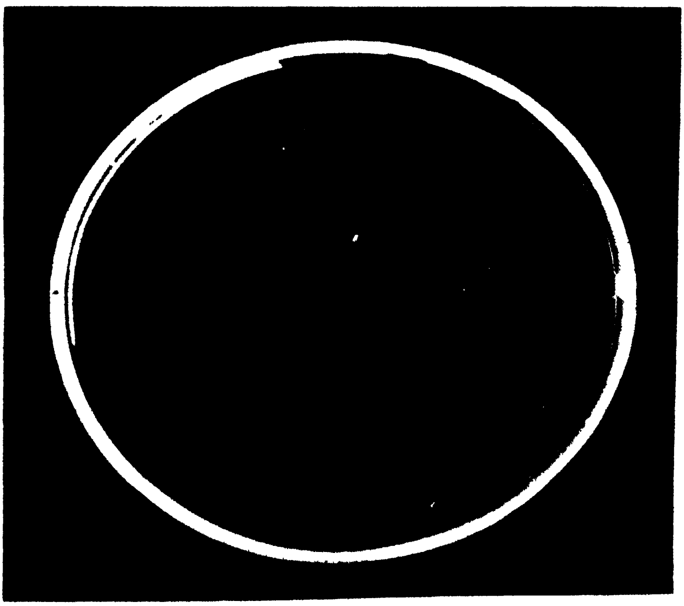
paper on this butter moulds were growing in great numbers, and the whole surface of the butter had become brown and mouldy, rendering it really unfit for export; and it might be added that its export was prohibited. Without some such law as the Commerce Act, there is no doubt this butter would have gone forward to London, branded—Prime New South Wales. Illustration No. 11 shows the underneath side of the lid of one of these boxes. It has evidence of having been in contact with the mould-growth which was present on the butter and parchment paper. No doubt the factory which made these butters suffered considerable monetary loss, unless the shipping companies made them some compensation, which is unlikely, because the delay in the boat was due to weather influences. Nothing serves better to illustrate the necessity for a properly refrigerated chamber for butter in all these coastal boats. When the temperature rises, fermentations of all sorts proceed, and the butter becomes ruined. These illustrations also serve to show the great advantage which railway connection would be to some of the northern river districts for the purpose of carrying their butter regularly and quickly to market.

Illustration No. 12 presents the aspect which one of the butters submitted for grading recently presented, the output coming from a Northern River factory, in which case, as far as we know, there was no delay of the boat. A mould-growth is seen here on the parchment paper in which the butter was wrapped, and if this butter had gone to London with this paper on, there is no doubt that the mould-growth would have developed sufficiently during the voyage to ruin the butter. This subject of mould-growth on parchment paper and on butter would in itself form sufficient material for a long article, and it is only referred to here to demonstrate to factory managers how careful they should be with regard to the storage of their parchment paper and the storage of their butter-boxes, and to the necessity for immediately heading-down the boxes after they have been filled, so that mould spores may not drop on the surface while the boxes are lying in the factory after being packed. The drier the surface of the butters, the less liability there will be to any mould-growth of this kind, and factories that are frequently troubled with any complaint of this nature should adopt special methods of prevention, such as the use of formalin, for the destruction of the organisms, and the lining of all ceilings with some metal or painted iron, or plaster, instead of timber. The rooms in which the paper is stored may with advantage be frequently disinfected with formalin, and the best method for doing so is to evaporate the formalin and close all doors and apertures for, say, an hour.

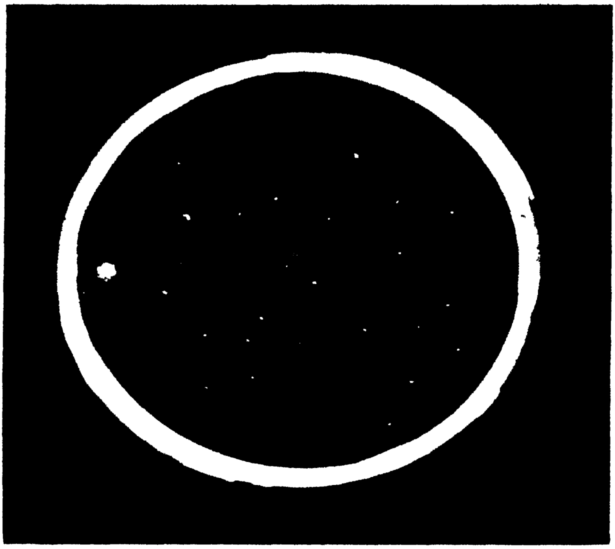
Illustration No. 13 represents a superfine butter from one of our most successful factories, viz., Kyogle; and Illustration No. 14 represents a superfine butter made at the Alstonville Factory, on the Richmond River, another of our extremely successful institutions. Illustration No. 15 represents butter from the same factory a month later. It was also superfine, as is, practically speaking, all the butter exported by these two factories. The two illustrations, 14 and 15, show how regular is the



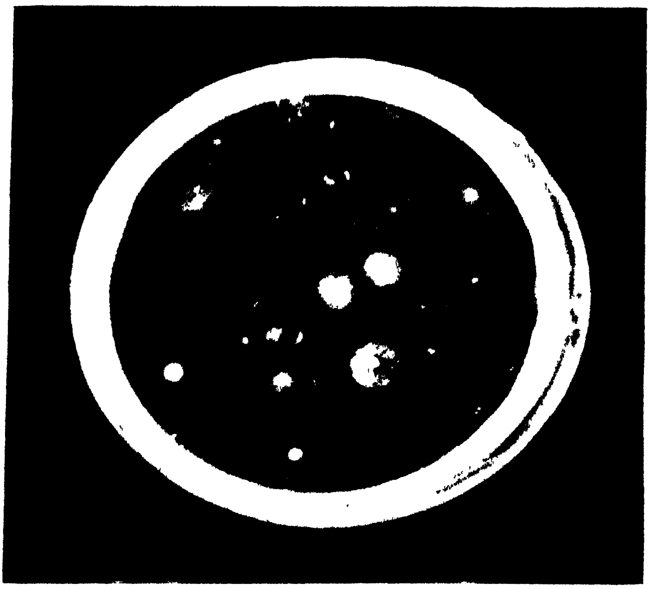
No 13. Represents the bacteriological condition of a superfine butter, made at Kyogle Factory. No injurious bacteria are present, the only organisms showing being *B. acidi lactici.*



No. 14.—Illustrates, bacteriologically, another superfine butter, made at Alstonville Factory. The little white dots represent colonies of *B. acidi lactici.* No injurious bacteria are present.



No. 15. Represents a superfine butter, made at the same factory as No. 14, one month later than No. 14. This shows the consistency of the manufacture, practically and bacteriologically.



No. 16.—Represents a second-grade butter, due to its fishy flavour. The fishy mould, *Oidium lactis*, is present in large numbers.

bacteriological condition of this butter, and it tallies in full with the regularity of the quality. All three show excellent butters, bacteriologically speaking. Later on, it is intended to give bacteriological illustrations showing the condition of the butter from other factories, but it is evident that only in cases where the butter is first-class can the name of the factory be given.

In connection with the question of grading and inspection of butter for export, it is pleasing to be able to give the attached report by the New South Wales Government Inspector in London, Mr. J. Gillanders. The report shows clearly that there is tightening-up all round since the inspection and grading of butter commenced last October. The points that are drawn attention to by Mr. Gillanders with regard to the stencilling of the brand or letters on the boxes, and also the question of inferior parchment paper, are those that are being remedied more or less every week; and the attention of factories is turned to these points by this office every time that the grading tickets are forwarded to the factories. However, in the case of new factories, and in the using up of old stocks, it is impossible to prohibit the absolute use of stencilling; but next season it is hoped that the whole trade description will be thoroughly and neatly impressed into the butter-boxes by all factories.

7th March, 1907.

Butter Report ex S.S. "Geelong," "Marathon," and "India."

By Mr. J. Gillanders.

With the arrival this week of the above three steamers I have been able to make inspection of a larger number of brands, and beg to enclose you my detailed reports. In the past I have had considerable experience with a number of the brands inspected, and it is most gratifying to notice in the above shipments a great improvement in the quality, style, and finish of the butter as compared with even a year ago, and everything points, in these shipments, to a most determined effort on the part of the factories to make good butter and to give satisfaction on this side. More, however, can still be attained by some of the factories in this direction. I strongly recommend all of them, even those who have got the quality right, to watch details, such as packing, branding, &c. Quite a number can improve in these matters. I notice some of the factories are using too poor quality of parchment paper, with the result that where this parchment paper is used it will not stand the moisture from the butter, and the moment it is touched it breaks. Some, however, leave nothing to be desired in this direction. Some are branding the boxes very indifferently; others badly. Where ordinary stencil is used the brands have a smudged, dirty appearance, and buyers do not like this. Some of the boxes are a little rough and some attention there is also desirable. Taking the shipment all round, condition may be considered good and the butters have carried well on each of the steamers. There was no damage noticeable to the butters by the "Geelong," which was in collision in the Channel.

A later report, dated 15th March, received from the Agent-General, and containing remarks by our London Inspector, goes to show clearly that, as stated higher up, the complaints regarding grading have been due mainly to a want of knowledge of the bases of the standards. The following extract illustrates this:—

The complaints made by the trade concerning the grading are found to be generally due to the wide latitude of points allowed and not to any error in the work of the graders who award them. It seems generally considered that butters below 90 should not be graded as first-class, as country buyers who have bought on the Government grade object to accept first-class butter and pay first-class butter prices for it when it is graded as low as 86, or, in fact, below 90 points.

Government Cattle Exhibited at Sydney Show.

M. A. O'CALLAGHAN.

Part I.

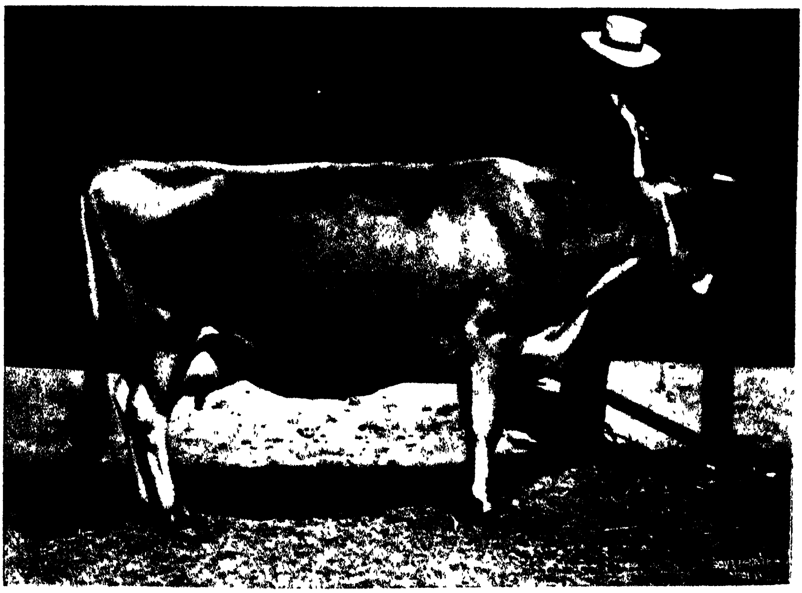
In this issue are given four illustrations of cattle exhibited by the State Stud Farm at Berry during the recent Sydney Show. For want of space it is impossible this month to deal fully with the exhibits, and it is intended to continue this series next month.

The animals illustrated in this issue are the Jersey bull "Sir Jack," with his mother "Lady Tidy III" (imp.), together with the two Guernsey heifers "Flaxy II" and "Calm II." Probably the greatest surprise of the Sydney Show was the high valuation placed by purchasers on first-class Jersey cattle, whereas milking Shorthorns and other breeds were sold at prices rather lower than usual, due it is stated, in the case of Shorthorns, to tick scare on the Richmond River. Jerseys fetched much higher rates than we have been accustomed to of recent years. One bull fetched as high as 150, and another 90 odd guineas, so that it would appear the public are waking up to a just appreciation of the useful, as well as handsome, Jersey cow. This increased demand has been evident to me for some little time, because there has been a strong demand for Jersey bulls bred by the Government at enhanced prices, and many breeders attribute the additional popularity of the Jersey to-day in no small way to the excellent specimens imported by the Government, the animals bred from them being distributed, and acting as apostles for the Jersey breed as a whole.

The bull "Sir Jack," illustrated here, is not quite 3 years old. He is descended in a marked degree for dairy purposes, his mother "Lady Tidy III," being one of the best dairy cows imported, yielding on ordinary grass feed as much as 333 lb. of butter in a milking season of thirty-eight weeks; whereas his grandam, on his sire's side, "Rum Omelet" (imp.), yielded 332 lb. of butter in thirty-four weeks.

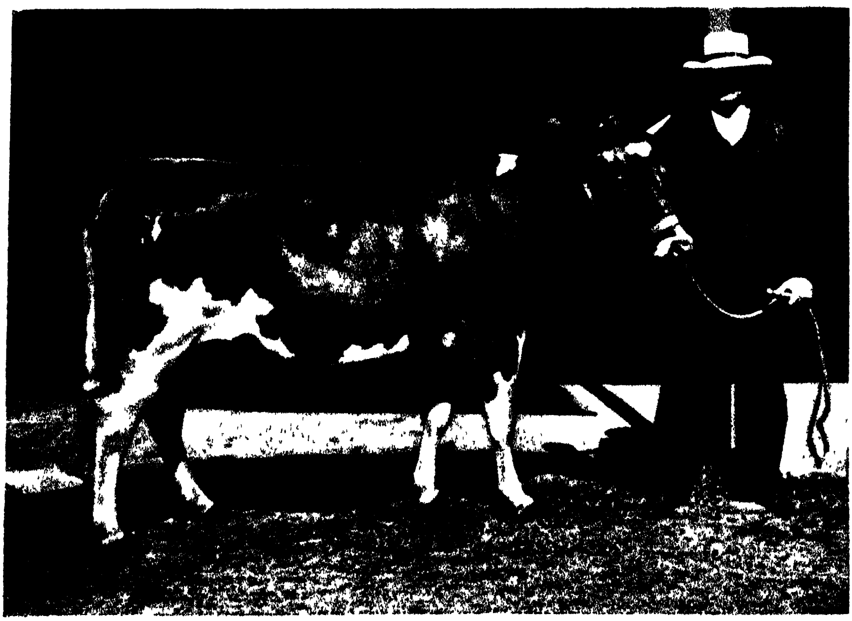
It might be pointed out that these cattle have been constant breeders, and the aim of the manager of the Stud Farm is to get as many calves as possible from the cows, rather than to put up a long milking season with big records. The great grandam on the sire's side is also a cow imported by the Government, viz., "Miss Lucy III," a cow that was awarded a prize at the London Dairy Show, and comes from Mr. Mutton's great butter-producing herd, as does "Rum Omelet." "Miss Lucy" gained first prize as a heifer at the London Dairy Show, 1897, and "Lady Tidy III" was a noted prize winner in England, as also were her brother and sisters, so that, apart from the butter yields of his ancestors, this bull comes of a strain true to type as shown by the awards already stated.

Jersey Bull, "Sir Jack."



Jersey Cow, "Lady Tidy" (imp.) at 13 years old.

Guernsey Heifer, "Calm 2nd."



Guernsey Heifer, "Flaxy 2nd."

The Jersey Society of Australia has been re established on what appears to be a sound basis, but more of this next month.

The Guernsey heifer "Flaxy II." is by "Rose Prince" (imp.) from "Flaxy" (imp.), and the Guernsey heifer "Calm II" is by "Rose Prince" (imp.) from "Gentle," from "Calm" (imp.). Both these heifers were greatly admired during the Show, and it would be difficult to find two better specimens of dairy cattle of the same age. "Flaxy II." is a 3-year old, and "Calm II" about 2½-years old. "Calm II" shows very classical lines as regards the Guernsey breed. "Flaxy" yielded 334 lb. of butter in a short season of thirty-four weeks, whereas "Gentle," on her first calf, yielded 551 gallons of milk in a period of thirty-six weeks, so that it will be seen how well-bred these heifers are from a milking point of view.

(To be continued.)

MONTHLY WEATHER REPORT.

HAWKESBURY AGRICULTURAL COLLEGE, RICHMOND.

SUMMARY for March, 1907.

Air Pressure (Barometer).			Shade Temperature.				Air Moisture Saturation = 100.			Evaporation (from Water Surface).			
Lowest.	Highest.	Mean.	Lowest.	Highest.	Mean.	Mean for 15 years.	Lowest.	Highest.	Mean.	Most in a Day.	Total for Month.	Monthly Mean for 9 years.	% of the year's Evaporation.
29·76 5	30·28 11	30·03	45·0 29	92·3 30	67·32	69·1	45 21	100 14 & 13	71·77	·231 25	4·006	4·5	8·5

Rainfall { Points 4 86 59 13 1½ 2¼ 13 76 78 35 1 1 11 26 5 5 = 427 points. Mean rainfall for 15 years. 391 points.
{ Dates 3 4 5 10 11 13 14 15 16 17 19 20 23 24 25 27

Wind ...	N	NE	E	SE	S	SW	NW
	4	9	2	4	20	1	1

Greatest daily range of temperature—43·1° on 29th.

Thunderstorms, 2nd, 3rd, 4th.

Days on which temperature rose above 90°— 90·3 (4), 90·8 (5), 92·3 (30).

Remarks.—A remarkably cool month. Rainfall well over the average; the best monthly fall since December, 1905. Wind, generally from south.

W. MERVYN CARNE,
Observer.

Poultry Notes and Excerpts.

G. BRADSHAW.

NOT many are aware of the far-reaching influence of a large poultry show, such as that held at Moore Park. These shows demonstrate in the most forcible manner what can be done by men in moulding animate creation. They convince by arguments that cannot be controverted, and show by actual example what is possible in poultry-breeding, and incidentally prove the business is a source of wealth, otherwise the industry would not be flourishing as it now is. The poultry business, with its many subdivided branches, really means more than it appears to upon first sight. The ordinary individual is content with, perhaps, one or two branches of the business, and because he is content he never stops to see whether there are any more or not. Eggs and meat do not contain all there is in the business of rearing poultry. If any person thinks that one can get all out of the business there is in it by simply throwing out feed to the poultry and rounding up the products as occasion requires, he is liable to be mistaken. For the edification of those who have never stopped to think what the whole business of poultry-rearing means, it would be well to mention its different phases, all of which have advocates, and a great many turn some one or more of them to profit. The various branches of the industry may well be named—as eggs for market, eggs for hatching, newly-hatched chickens, roosters, young stock for breeders, old breeding-stock, and experience. In order to get the full benefit of the latter, one must have had something to do with all branches of the business. The poultry business can truly be said to be multisided, and, after all, there are only two methods for profit—a right and a wrong method. One branch may be all right for one locality, and all wrong for another. It is left to every poultryman to select the branch he will take up, and he should know his market. After looking the field over and taking his bearings, he should select the breed that will bring him the best results. In the suburbs eggs are more profitable to produce than market poultry, owing to the room being limited, and there is never a time when good, well-flavoured fresh eggs cannot be sold for high prices. The various poultry shows held in the city bring home to the people that a pleasant business can be carried on in a limited space, and experience has taught us that, wherever one man or woman is converted to the love of poultry, there is an added demand for good stock for market.

There is a striking adaptation of the digestive organs in animals to their several conditions and wants. In some of the lower orders the body is "all stomach," having no appendages, or only those necessary to convey

food to the receiving orifice, as in the earthly worm, or the little hydra found in fresh water. With the higher order of animals there is the necessity of catching, crushing, grinding, and salivating before the food is taken into the stomach. How is it with birds? How do the tenants of the poultry-yard prepare and digest their food?

Fowls have their bodily construction with special reference to flying. Poor economy to put a heavy jaw and set of teeth in the head of a bird! The head must be small, light, and pointed, to cut the air. It is only provided with an appendage to tear flesh or pluck grain seed or fruit and seize insects. The bird of prey has a hooked beak to tear flesh. Our domestic fowls living on grain, grass, fruits, insects, &c., have beaks just suited for the purpose. Everyone who feeds poultry knows with what ease and rapidity they can stow away food. The crop is the only storage room—or, properly, the hopper. Here is deposited all the food, whole, or only divided just enough to go down the passage. In the gizzard is carried on the process of grinding, and the "hen's teeth" are only found there. The inside—wall, so called—of the gizzard is hard and tough. These walls press towards each other by the contraction of muscles on the outside, so that the food, when let into the gizzard from the crop, is ground as between the upper and nether mill-stone. This grinding is facilitated by the mixture of gravel or other substances, which the fowls take from time to time as needed.

In a healthy fowl, the work of digestion is very thorough. Gastric juice is formed in glands above the gizzard and poured in during the grinding process. As fast as the food gets into the right condition it passes from the gizzard to the intestines. Carnivorous birds, or those living exclusively on flesh or fish, have no such grinding organ.

If there is anyone who needs a word of advice on starting out in the business world, it is the one that starts in the poultry business. It looks so easy, that almost anyone thinks that he can do it and be successful. He reasons that all you have to do is to get several hens, put them in a house, commence feeding them, and then gather in the eggs. He does not count the expenses, and soon sees himself getting rich. Often he will start out with several hundred fowls of different breeds, having had scarcely any experience; disease gets in the flock, and he is puzzled to know what to do. He writes to the papers, and tries all the remedies he hears of, and some of his own make as well, until he has only about half of his stock left; he gets discouraged, throws up the job, and asserts that poultry does not pay. This same party could have started out in any other line and done just as well. He might have noticed that drapers, bakers, butchers, &c., make money at their respective callings, and to have started in any of these he could not have done worse. However, the fact is, these people had each their trade to learn, and without this apprenticeship they, like the would-be poultry-keeper, would be dismal failures. The man or woman who desires to enter the poultry business with assurance of success must begin from the bottom and work up.

They should begin with a few hens, or, better still, get a job on a small poultry farm where they can learn the business. There are too many ups and downs in poultry-keeping, as a business, for the inexperienced to embark in it. The successful poultry farms in the Sydney suburbs are the outcome of small beginnings. Some commenced by keeping a few hens, others with a brood or two of ducks, the output of these respective parties amounting, in some cases, to several thousand head of fowls and ducks per annum.

The beginner should commence with pure-bred stock, and only one, or, at most, two varieties should be kept. The business should be carried on in connection with other work for two or three years. By this time the poultry apprenticeship should be completed, and the stock increased to such an extent that after the third year a living may be expected from the business.

Amateurs taking up the breeding of fancy poultry will find themselves confronted with some hard problems before they attain a degree of proficiency in the production of specimens possessing a desired shape and colour. To the average man not acquainted with the subject, it would seem to be a very simple matter to mate up a pen of birds for breeding; but just here the problems come in, the difficulty being in selecting the right male birds for a lot of females, and the right females for a certain male. One of the usual rules laid down for this work is to counterbalance a defect upon one side by a corresponding excellence upon the other side. That is, if the hens chosen are deficient in shape or colour in certain sections, select a male bird particularly strong in the same sections, so as to adjust the quality as far as possible in the progeny. It may seem an easy matter to adjust defects and excellences, but it only requires a little experience to convince one that it presents problems by no means easy of solution, as a defect, say in a female, is not always corrected by using a male bird particularly strong in the section where the female is weak, as it may be that the female is the stronger in the power to transmit individual characteristics and qualities, and will, by reason of this stronger breeding quality, cause the chicks to more nearly resemble herself, and to be a reproduction of her defects as well as good qualities. If a defect upon one side could be eradicated by using a bird upon the other side that possessed unusual excellence where the other was defective, the work of producing specimens of unusually fine quality would not be a difficult one; but when one must take into consideration the fact that birds vary greatly in the power of reproducing their own qualities in their progeny, it will be readily seen that it is no easy problem to so adjust the strong and weak points of the breeding stock that their progeny will show decided improvement, and place better material in the hands of the fancier for his next season's work than he had when starting the season with the present stock. From the above it will be seen that the breeding of prize poultry is a complicated matter. The problems are numerous, and must be solved if one would be successful. If it was an easy matter to produce

birds of high quality, and that anybody could succeed in it, most of the interest would be lost, and the fancy and fancy prices for high standard stock would not be what they are to-day.

The power to produce eggs is a practical quality, and may be increased by cultivation, the same as any fancy quality. It is possible, by careful selection of birds to be used in breeding, to build up a strain of fowls that will excel as layers. This practical quality may be developed to a strong degree, but cannot be carried beyond a certain point. The work along this line will be found to produce similar results to that along the line of improvement of any certain quality—that is, it will be found that only a small percentage of the young stock from the best of matings will prove superior to the parent stock, while a large percentage of it will be inferior; so that the improvement process. is slow, and it would take a considerable time to build up a large flock that would excel as layers.

There will, of course, be individuals that will possess unusual excellence, but such individuals very often are unable to produce chicks that are their equal in good quality, so that the work of building up a fine line of layers, say from 200 to 250 eggs, is no small task, and will require careful work to accomplish. It can be done only by the use of the best layers as breeders on the female side, and by the use of male birds that are the direct descendants of females that excel as layers. It is simply following out the plan of breeding generally used in the production of any line of quality, and that is that the birds used as breeders must possess the qualities which are desired to be produced in their chicks to as great a degree as possible. But even with the best laying, their feed and care must be right in order to get the best results from them. One cannot expect a long-continued supply of eggs from any flock without furnishing them with the material from which they may be produced.

Poultry-keepers who make a practice of having roosting-places built upon what is known as the open-fronted principle, invariably find that they have far less roup and other troubles among their poultry during the winter than was the case when they kept their fowls shut up with comparatively a small amount of ventilation. The reason why poultry do so much better in open-fronted roosting-places than they will do even in the most carefully-ventilated closed-up roosts is that they are practically sleeping in the open air, and there is never any change of temperature so sudden as to affect them—they are free from cold draughts; there never can be any accumulation of vitiated air; and in the morning, when they are let out, they do not come from a warm place into a cold place, and so contract a chill. Of course, an open-fronted roosting-place ought to be fixed so that its open front faces the north, and the other three sides, or, rather, the back and two ends, should be very closely fitted together, so as to prevent the possibility of draughts of any kind. Under these circumstances, the fowls will be perfectly well protected from the south and east winds, which are prevalent during the winter season, so that they will be free from the most adverse influences of the weather,

and at the same time they will be in an equable temperature, and they will constantly be breathing perfectly pure air.

Of all the varieties of domestic poultry, turkeys have the character of being the most difficult to rear. They need the most attention during the earlier stages of their growth, and if this attention be not paid, the probabilities are that there will be a very serious loss. In the first place, it is most important that birds raised should have sufficient space, as it is absolutely useless attempting to rear turkeys in a limited run. This is where poultry-breeders make a mistake, and when failure meets them they put it down to every cause but the right one. It must be remembered that the turkey is really the last of our domestic fowls that have been brought from its wild state under domestication, and the infusion of fresh blood from America introduces again some of the wilder instincts, so that, as the American wild turkey is allowed to roam where it will, confinement causes the birds to pine and die. It has been customary to lay great stress upon having a dry soil upon which to rear turkeys. What is most of all to be desired is that the soil should be porous, carrying off the water speedily, and not be heavy clay. Warmth is also essential, and a cold, bleak place would not be suitable for this purpose. Some districts are more suitable for rearing turkeys, because, from the nature of the soil, insects and grubs are most plentiful, and as the turkeys feed on these to a large extent, they thus thrive better than where they are scarcer.

Common hens are of all shapes and colours that fowls ever grow, and they are frequently abused, and sometimes half-starved, and left to shift for themselves generally. But for all that they pay their way; and more, they live and thrive and bring up big families of healthy chickens under the most discouraging circumstances. Common fowls are extremely hardy, good foragers, mature early, are good layers, and excellent mothers, and if one cannot afford to start with a flock of pure-bred fowls, it will pay to start with common fowls. They can be greatly improved in point of size by always selecting the largest and best to breed from, and the laying qualities can be improved by always setting only eggs from the hens that are known to be the best layers.

On some farms where this course has been steadily followed year after year the fowls have greatly increased in size, and rival the Leghorns and Orpingtons in egg-production. The above should not be taken as an argument in favour of common fowls over the improved varieties, for it is nothing of the kind. Thoroughbred fowls will pay the poultry-keeper better than common fowls, just as surely as the thoroughbred cow will pay the farmer and dairyman better than a common cow. But there are many who have read so much that has been written about starting with "the best," that they really believe it will not pay to start until they have money enough to buy a flock of high-priced pure-bred fowls; but it has in many instances paid to start with "just common fowls," and the stock has been improved as they go along.

A point that greatly troubles many poultry-keepers—especially those who are beginners—is what quantity of food shall they supply to their poultry in order to procure the best results and to maintain the birds in good condition. Were it possible to answer such a question as this by giving a stated amount, one of the most difficult matters in rearing and maintaining stock birds would be overcome; but it is quite impossible to give a satisfactory reply. The fact is, the quantity must be determined by a variety of circumstances, all of which have a very material effect. In the first place, it depends upon the breed, some requiring two or three times as much as others to keep them in good working condition. To take a few examples: From some very interesting and exhaustive experiments conducted a few years ago by an eminent Frenchman, it was shown that, whilst the white Leghorn could subsist and thrive well on 4½ oz. of food per day, the silver-grey Dorking required 6½ oz.; whilst the Houdan required 6½ oz., the buff Cochin required 7¼ oz.; and, whilst 4¼ oz. were sufficient for the Hamburgh, the Langshan needed 7 oz. Thus, at once it will be realised how misleading it would be to give any stated figures.

Then, again, it depends upon the conditions under which the birds are kept. If they have a free range they will be able to procure a good deal of natural food for themselves; while, on the other hand, if they are confined to runs they will require more food, being unable to roam about and pick up worms, grubs, insects, and the like. It depends also upon the nature of the soil. Fowls which have access to a good meadow or some rich arable land will not need as much as if kept upon poor, sandy soil. Then, too, the time of year makes all the difference in the world to the amount to be supplied to the fowls. During the growing period of the year, when there is an abundance of natural food in the soil, it would be folly to supply the fowls with the same amount as during the cold, wintry weather.

It has been shown, therefore, how impossible it is to lay down any hard and fast rule as regards the exact quantity of food to be supplied to the birds. The only satisfactory method is to periodically examine the fowls, and if they are too lean, increase the quantity; if too fat, reduce the supply. Only in this way is it possible to maintain the birds in good working order. Fat birds always prove most unprofitable. They lay a considerably fewer number of eggs than those in a good, hard-working condition; whilst it is equally as bad to keep them too thin. There is a happy medium to strike, and this can only be done by handling the birds every few weeks, and regulating the supply of food accordingly.

In England, Aylesbury is the great centre of duck-breeding. The majority of the ducks reared for the market come from the hands of the better-class labourers, some of whom have raised themselves into a very comfortable position by this industry. Operations are usually commenced in December, when the eggs for producing the earliest broods are set. As a rule, the breeders do not keep the adult birds themselves, but on all the farms in this district flocks of ducks are kept, and contracts are

made with their owners for a constant supply of eggs during the coming season. These are at a uniform price; but there is a great variation if bought without such contract. In May, 2s. per dozen would be a fair price for duck-eggs; but in December, 12s. per dozen might have to be paid. It is a matter of supply and demand, though the value of a duck-egg in December is also measured by the fact that the possible duckling within it may be worth 6s. or 8s. in May, whereas the other would not realise more than half that sum. The eggs are taken by breeders and set under hens, for ducks are very seldom employed for the purpose. Hens are found more reliable, and do not require the same amount of attention as do ducks. For this work, artificial methods of incubation have not come into vogue, though there is no reason why they should not. The hatching hens are accommodated in outhouses and sheds, and there is a cottage where 150 hens are at work on maternal duties at one time. Every day they are fed, and the nests examined; but this is simple compared with the labour involved at the end of four weeks, when the young ducks begin to appear. Ducklings have one special characteristic in that they need no brooding, so that the progeny of half a dozen sitters can be placed under charge of one hen. From the first, the feeding has in view the development of flesh and not bone; consequently, only those meals which are strongest in flesh and fat-formers are used. For the first few days hard-boiled eggs, rice, and bread are given, after which barley-meal mixed with scrap or tallow cake and grains form the staple diet. On such feeding as this the growth is simply marvellous. Kept in batches of about fifty, they are fed with the greatest regularity. Some of the ducklings sent to market have never known what it is to be in water; but as a rule they are occasionally allowed a bathe or swim, and this gratification of their inherent instincts makes them more contented, and they thrive all the better for it. The pens in which they are kept are none too large; but there is reason in this, and fresh straw is supplied every day, their greatest enemy being cramp, to which they are very subject if exposed to draughts, or if the place is too damp.

Many poultrymen do not understand the importance of keeping birds busy by making them work (scratch) for their grain. The birds being idle is the cause of most of the troubles that affect the flocks; it seems as if the very spirit of evil entered into them when they have nothing to do! The vice of feather pulling (and eating), of egg eating, and many such evils are more than half due to their not being employed in scratching and searching for their food.

It is not only these vices that make keeping the fowls busy so essential —it is for the best interest of both the birds and the owner. The animal economies, the digestion of the food and turning it into flesh and bone, also a due proportion into eggs, are directly promoted by exercise. All the bodily functions are stimulated; the blood flows more freely through the arteries and veins; the old, worn-out tissue is replaced by new; and the general good health of the birds is insured by abundant exercise.

When a fowl is moping on the roost or huddled in a corner her circulation is sluggish—the animal economies drag; it is then that ill-temper manifests itself in vicious pecks at any bird that comes near, and the sluggish bird is predisposed to "treasons, stratagems, and spoils."

Make the birds scratch for their grain food, and we overcome the sluggishness and promote their best interests. This is Nature's way. It was not intended that the birds should gorge themselves with food, and then get up on the roost, or go off in a corner, and mope. In the natural way of feeding, biddy used to get a seed or grain here, a bug or worm there, and sometimes do a big lot of scratching for either seed or worm. The exercise of searching and scratching was good for her; a hen has no teeth with which to chew her food—she has to depend upon attrition to do the grinding of the food in the gizzard, and that attrition is wholly dependent upon muscular action. The free movements made by her scratching and searching help grind the food that has passed on to the gizzard, and if we would do the greatest kindness to our flocks we would take pains to induce them to scratch and search for every kernel of grain they eat. Compel the scratching and searching by throwing the grain into straw (or other scratching litter) on the floor of the pens, and we promote digestion, quicken the circulation, favour good health and virtue, and these join in promoting egg-production.

The care of breeding stock properly begins some time before the breeding season opens, so that the birds may be in the right condition when wanted. After the opening of the breeding season, and while the hens are laying well, the aim should be to so feed as to keep them in good condition as regards health and vigour, so that results from their eggs may be as good as possible. This diet should be as varied as circumstances will permit. After they begin laying they should be kept at it until the close of the season, or till all the eggs desired have been obtained. A grain ration should be given each day and scattered in their scratching material, so that they may scratch for it. This form of exercise is most beneficial. Keep them busy, supplying sufficient feed to keep them in good physical condition and to encourage egg-production. Many male birds will lose flesh when placed in the breeding-yard, because they will not feed while the hens seem to care for it. Such disposition upon the part of the male bird is a desirable one, and such birds generally prove better breeders than those that struggle to get their share of the feed even if they have to drive the females away, and they seldom stop at their share, but want more than that. Avoid using male birds of this type as much as possible; a watchful eye should be kept over the breeding stock, ready to note any signs of weakness or undesirable features connected with their value as breeders. They should simply be kept in good working condition, so that their chickens may possess the necessary vigour and strength of constitution to bring their good qualities out in their best form.

Feeding Farm Animals.

MANY districts of New South Wales are similar as regards climate to California, and for this reason any carefully prepared information emanating from there is of great use to New South Wales farmers. The following article is extracted from a bulletin of the University of California, which dealt very completely with the subject of feeding farm animals :—

The great interest which is being taken in the feeding of animals, and the constant demands which are being made on this Station for information along these lines, has made it imperative for us to issue this bulletin, setting forth the general principles underlying all animal feeding, together with such data and comments as have seemed most essential for the farmer and stockman. Notwithstanding that the majority of the experiment stations have issued bulletins covering the same subject, the climatic conditions obtaining in California, and the wide difference in our foods from those of the older States, render it necessary that this bulletin be issued to deal more intelligently with the environments peculiar to this State.

Some of the matter here presented concerning the general principles of feeding is reprinted from the Annual Report for 1894–95, the edition of which is exhausted.

Objects of Feeding.

It is well known that the young animal body requires food to supply the material necessary for its growth. But beyond this, and continuing during and past the growing stage, there is a constant wearing out and breaking down of all the tissues of the body, and this loss must be supplied in order to keep the animal in a normal, healthy condition. Not only must the worn-out tissues be replaced, but the material used in producing the energy necessary for carrying on all voluntary and involuntary functions, must also be supplied. An animal which is working hard in the plough is using up a great deal of fatty tissue as well as muscle; but the animal which is doing nothing—that is, making no voluntary exertion, experiences a loss of tissue through the constant production of heat necessary for the maintenance of the normal body-temperature, and also for the performance of all the involuntary functions of the body. Hence, we might summarise the objects of feeding as follows:—

(*a*) To maintain bodily heat.
(*b*) To repair waste of tissue.
(*c*) To reproduce young.
(*d*) To form new tissues or organs.
(*e*) To perform muscular labour.
(*f*) To secrete various products.
(*g*) To lay up reserve stores.

Composition of Foods.

In order to see how these objects may be best carried out, we must understand the composition of these tissues that need rebuilding, and also the composition of the various foodstuffs at our command. Viewing them side by side, for the purpose of better comparison, a general analysis shows each to consist of the same four main ingredients—water, mineral matters, nitrogenous and non-nitrogenous material.

Water constitutes about two-thirds of the weight of the body, entering into the composition of all its tissues and fluids. As it does not form nearly so large a proportion of the ordinary ration fed to stock, we can readily understand the necessity of its forming a separate part of the animal's food.

The *mineral matters* comprise about 5 per cent. of the body-weight, and have important functions to perform, such as entering into the formation of the teeth and bones, and regulating the density of the blood and other fluids of the body, such as the juice of the stomach, &c. When estimating food values the mineral or inorganic ingredients are generally omitted, not on account of any lack of importance of that portion of the food, but for the reason that nearly all foodstuffs, no matter of what description, contain a sufficient amount of these substances, which are mainly lime, potash, and phosphoric acid, with varying amounts of sodium, iron, magnesia, sulphuric and hydrochloric acids, silica, &c.

The *nitrogenous matters* of the body, of which the major part are called proteids, the only ones that contain nitrogen. are found mostly in the muscle, gelatinous part of the bones and tendons, brain, nerves, and internal organs; in short, all the working machinery of the body is composed principally of this important material. Similarly, in the foods, the main part of all the nitrogenous material is termed protein, signifying, by its Greek derivation, to take first place. Another name for the proteids is albuminoids. This important ingredient of the food is found largely in the white-of-egg, the "myosin" of lean meat, gluten of grains, oil-cake meals, &c. Besides the albuminoids there are other nitrogenous matters, chief among which is the class known as amides, which are found to a greater or less extent in all foods, more particularly in those of vegetable origin. The physiological action of amides is similar to that of fat and carbohydrates.

The albuminoids in the different food materials are estimated from the nitrogen by multiplying the figure for the latter by 6·25; nitrogen being 16 per cent. of the albuminoids. In England the factor used is 6·33.

The nitrogenous compounds of the food are generally, for the above reasons, reported as *crude protein*.

The necessity of the albuminoids, or protein, in the daily food of an animal depends not only upon its important relation to such tissues as bone, muscle, blood, nerves, tendons, &c., but also upon the fact that, as far as we know, no albuminoids or protein matter is formed in the body, except by the transformation of similar substances presented to it from external sources. It cannot be obtained by conversion of any other material.

The protein can be changed into fats, and thus may serve as a fuel for the body, but *fats* cannot replace *protein*. The protein, or flesh-forming ingredients, *can* serve as fuel, and in certain cases take the place of fats and carbohydrates, but it would be extremely unwise and uneconomical to use them for that purpose, as it would always be done at a far greater cost.

The *non-nitrogenous* part of the body is principally fat, the substance which is consumed in the production of heat and energy. The source of this element in foodstuffs is comprised in all those portions which are free from nitrogen. They are divided into two main classes—the *carbohydrates* and *fats*—and are identical with those found in the body, with the exception of starch and sugar, which are never found as such to any extent in the healthy body. The carbohydrates are sugar, gums, and woody fibre; the first three are, in order to conform to the general usage, classed together under the head of " nitrogen-free extract." The gums play only a secondary part as regards the nutritive value of the food. The carbohydrates are first changed into fats, and then used as fuel; though it must be remembered that for the purpose of heat, fat is worth 2·25 times as much as carbohydrates (that is, 1 lb. of fat is equivalent, when used as a fuel, to 2·25 lb. of starchy matter). When there is a deficiency in the amount of these elements in the food, the fat of the body is drawn upon.

The fat, as might be supposed, varies in amount more than any other substance of the animal body. The fat seldom falls below 6 or rises above 30 per cent. If the supply is cut off, the surplus fat stored up in the body is drawn upon to keep the animal machinery going, and if this continues the protein is converted into fat and used as such. Thus, by having a proper proportion of fat in the food of the stock, not only is the fat of the body protected, but indirectly, also, the protein of the muscle and blood, which is most important.

The term fat includes the butter of milk, the fat of meats, oil of seeds, wax of plants, &c. It is determined by treating the perfectly dried substance with ether, the extract thus resulting being designated as " crude fat." As might be supposed, these ether extracts have different nutritive values—the fat from the green fodder being of less value than that from the meals and seeds. Some authorities, in estimating the nutritive effect of food, give to all the crude fats the same significance. The *use of fat* is mainly as a fuel supply to the animal body, although it may form fatty tissue, but *not muscle*.

Digestibility of Foods.

The chemical composition, alone, of the different food-materials is not of much value to the farmer or dairyman, if he does not know how much of each nutrient (the name given to the nutritive parts of the food—protein, fat, carbohydrates, and mineral matters) of the feeding stuff in question is digestible, or available to the animal. Most of the experiments in this line have been made in Germany, although some of the Eastern States are now carrying on this kind of investigation.

In all foods there is always a certain portion of each nutrient, whether it be protein, fat, or carbohydrate, which is not digested or assimilated, but passes through the body, and is valuable only as manure. In order to ascertain how much of each food is not digested, the material is weighed and chemically analysed before consumption, and the weight and composition of the animal excrement is also determined. The difference of the two analyses is taken as the quantity digested or assimilated. The results so obtained are termed *digestion coefficients*, and are only approximate, but, in the present state of such researches, the best data available. For each food the digestion coefficient may vary considerably—the more concentrated the food, the higher, as a rule, will be the digestion coefficient. For instance, while about 57 per cent. of the protein is digestible in oat hay, 78 is the coefficient for grain middlings or bran, and in some of the peas and beans we find as much as 88 per cent. of this highly important ingredient to be digestible.

To illustrate the above statements:—In every 100 lb. of lucerne hay (average of three analyses) there are 17·60 lb. of crude protein, 3·08 lb. of crude fat, 39·31 lb. of nitrogen-free extract, and 22·63 lb. of crude fibre. For this hay, according to the latest investigations, it has been found that of the protein about 70 per cent. is digestible; of the fat, 51 per cent.; of the crude fibre, 46 per cent.; and about 68 per cent. of the nitrogen-free extract can be digested. Hence, in 100 lb. of lucerne hay there would be 12·32 lb. of digestible protein, 1·57 lb. of digestible fat, 26·73 lb. of digestible nitrogen-free extract, or starchy material, and 10·40 lb of digestible fibre.

Nutritive Ratio.—The different feeding stuffs vary very much in their composition; peas and beans, and the concentrated foods in general, contain large amounts of protein, or muscle-forming ingredients, and very little of the non-nitrogenous materials; others, like the potato, corn, &c., have much starchy matter combined with small quantities of albuminoids; and, again, as in the case of the vegetables as a whole, we have small amounts of both carbohydrates, or fat-producers, and nitrogenous, or muscle-formers.

The proportion of these two important elements of the cattle foods is termed the *nutritive ratio;* in other words, the latter is the ratio of the digestible protein to the sum of all the remaining nutrients in the food. In estimating this sum, the figure denoting the amount of fat is multiplied by 2·25, because it has been ascertained by experiment, as before stated, that about 2·25 times as much heat is developed by the consumption of a pound of fat as by the same quantity of sugar or starch. This product is added to the weight of the carbohydrates, and the sum divided by the figure for the protein, the quotient being the nutritive ratio.

To illustrate this:—Let us take, again, lucerne hay, which contains, as previously noted, 12·32 per cent. of digestible protein, 1·57 per cent. of fat, 26·73 per cent. of digestible nitrogen-free extract, and 10·40 per cent. of digestible fibre. The fat percentage (1·57), multiplied by 2·25, amounts to

3·53; this added to the figure for the fibre and carbohydrates, 37·13, equals 40·66, which, divided by 12·32, the per cent. of protein, gives 3·3. Hence the nutritive ratio is 1 : 3·3; in other words, there is in lucerne hay 1 part of protein, or nitrogenous matter, to 3·3 parts of non-nitrogenous, or starchy material. The ratio is "wide," and termed a carbonaceous one, when the amount of protein to the remaining ingredients is small. A "narrow," or nitrogenous ratio, is one where the reverse is the case; that is, the amount of protein is considerable when compared with that of the carbohydrates, as in the example just given.

Potential Energy.

The measure of food as regards its fuel value is made in terms of "potential energy," the unit of which is the *calorie*, or the amount of heat necessary to raise the temperature of a kilogram of water 1 degree Centigrade, or 1 lb. of water 4 degrees Fahrenheit. Instead of this unit we may use a unit of mechanical energy, the foot-ton, which is the force that would lift 1 ton 1 foot, 1 calorie being equal to about 1·53 foot-tons.

Professor Rubner found, in experiments made in the physiological laboratory at Munich, the quantities of materials which were equal to 100 of fat to be as follows:—

Nutritive Substances, Water free.	As determined by direct experiment with Animals.	As determined by Calorimeter.
Myosin (proteid of meat)	225	213
Lean meat	243	235
Starch	232	229
Cane sugar	234	235
Grape sugar	256	235

Taking the ordinary food-materials as they come, the following general estimate has been made for the average amount of energy in 1 gram of each of the classes of nutrients:—

Potential Energy in Nutrients of Food.

	Calories.	Foot-tons.
In one gram protein	4·1	6·3
In one gram fats	9·3	14·2
In one gram carbohydrates	4·1	6·3

These figures mean that when a gram of fat is consumed, be it fat of the food or body fat, it will, if its potential energy be all transformed into heat, yield enough to warm 9·3 kilograms of water 1 degree Centigrade, or, if it be transformed into mechanical energy, such as the muscles use to do their work, it will furnish as much as would raise 1 ton 14·2 feet, or 14·2 tons 1 foot. The potential energy of the protein or carbohydrates is less than one-half that of the fat. These figures, as stated by Professor Atwater, are not absolutely accurate, and may be revised by future research in the subject.

Comments on Various Food-stuffs.

Silage and Vegetables.

One of the chief requisites of a ration for profitable milk-production is that it be succulent, by which is meant that a portion of the ration contains a large percentage of water. This watery condition, or succulency, adds to the palatability of the food, and also seems to have a beneficial physical effect upon the animal digestion. The cow, therefore, eats a larger quantity of food, digests and assimilates it more thoroughly, and consequently gives a larger flow of milk. Although the major portion of California does not have the long cold winters to which the Eastern States are subject, and where it is an absolute necessity to store large quantities of food, both succulent and dry, still every section of our State has a longer or shorter period during the year when pastures are dry. The provident dairyman, therefore, anticipates these dry months, and either lays in a store of green food beforehand, or has some growing which he may cut and feed to his cattle.

Roots.—Several of the vegetables are valuable in supplying succulence for the ration. Among the root class the one in most common use is the mangel-wurzel beet, because very large quantities can be grown per acre, and because it is palatable to all kinds of live stock. Carrots are also used in some sections, and they have the advantage of containing a slightly larger amount of dry matter than mangels. Of all the roots, moreover, none are more relished by horses than carrots. Sugar beets are not found profitable to grow for feeding stock, because they yield so small a tonnage in comparison to mangels, and the greater cost of growing and gathering can only be undertaken on the ground of their greater value for sugar. Potatoes contain about twice as much dry matter as mangels and three times as much carbonaceous material. They are, therefore, of greater food value, but, like sugar beets, have too high a commercial value as human food to make them profitable for stock.

Squashes.—Another class of vegetables which are useful and easily grown is that of melons or squashes. A very familiar example is the so-called *pie-melon.* This, like the ordinary field pumpkin, can be produced readily in large quantities on most lands, and it ripens at a time when green food is likely to be scarce. All of these vegetables when fed to dairy stock produce an increased milk yield, which is more than commensurate with their actual content of food substance. This is because of their palatability, beneficial effect upon digestion, and the addition of a wholesome variety to the ration. Any of the vegetables named may be fed with profit to swine and poultry when in confinement, and to sheep, especially during the nursing period.

Silage.—One of the most economical means of preparing succulent food for seasons of drought and for supplementary feeding is by the use of the

silo. It is, no doubt, generally understood that the silo, as at present constructed, is a huge tank having perpendicular walls and being made as nearly air-tight as is convenient. The usual size for the silo is 15 to 20 feet in diameter and 30 feet high. Into the silo is put the green fodder immediately after being cut fresh in the field. The most common crop for ensiling is Indian corn or maize, which is, moreover, the most profitable plant to grow for this purpose. At one harvest it furnishes a larger tonnage per acre than any other crop. The stalks, which if cured dry would be largely wasted, are kept in so soft a condition in the silo as to be completely eaten by the stock. Other plants, such as lucerne, barley, oats, and orchard grass, are sometimes ensiled, but we would not recommend their general use except in seasons or localities where corn may not at the time be available, or in case they might otherwise be rendered more or less useless if cured dry; as, for example, the first cutting of lucerne with its usual mixture of grasses. Almost any plant grown on the ranch may be ensiled. The chief question is, what can be most profitably made the main crop for the purpose? The proof is abundant that Indian corn is the most profitable. The sorghums* and sweet corn do not answer well for ensiling, because of their high content of sugar resulting in too much fermentation in the silo.

No better combination of foods for feeding cows in the stable can be imagined than lucerne hay and corn silage, and possibly a little grain, although a fairly well-balanced ration can be made up without grain. In such feeding it is best to give hay and silage each once a day. The amount of silage per head ranges from 35 to 60 lb. daily, depending upon the size and appetite of the animal and upon the supply of silage. The cattle will eat corn silage at all seasons of the year, even when on good lucerne or other green pasture; but if the supply be limited it can be most profitably fed when pastures are dry, or if the cattle should be kept off them because of heavy rains, or until the grass is of sufficient age and size to be of value. If the dairymen will erect silos and have their cows calve in the fall instead of spring they can secure as large a flow of milk during the season when dairy products are usually high-priced as they now have during the low prices of the spring months. Corn silage may be fed with profit to sheep as well as cattle, but not to other stock. Lucerne silage is fed successfully to all farm stock, including swine and poultry. Horses working hard should be given such watery food in very small quantities; while those at light work or doing nothing may be fed more, and will even make profitable use of some corn silage.

Soiling.—Another method of providing succulent food is to cut the fodder green and feed immediately to the stock. This method is known as "soiling." Any of the ordinary fodder plants may be used in this way—the most common being any of the corns, sorghums, oats and peas, cereal grasses, and the like. If this practice is followed the same rule would apply as in the case of silage—

* The experience in this State is that the sorghums are excellent for silage, and are more hardy than maize, and if chaffed make splendid silage.

to raise the crop which will produce the most and best food per acre. "Soiling" presupposes that the stock are being kept in small pastures or in corrals, or at least have but little feed on their range. It also calls for more labour than is necessary if the stock could harvest their own food, but less land is required to maintain the same number of cattle than if they depended wholly upon pasturage. The matter then lies between soiling on the one hand with less land and more labour, and pasture on the other with more land and less labour. With plenty of land available and labour high, we do not expect an extended adoption of the soiling method in California for some years to come. The more general use of the silo will also tend to reduce the soiling period, because experience shows that it is cheaper to provide green food for the year by one filling of the silo than by the daily cutting of standing fodder.

Lucerne.

The large amount of lucerne grown in the interior valleys of the State, and its great value as a stock food, render it an important element in the development of the animal industries, and one worthy of careful study and experimentation. Two factors make lucerne of great use to the farmer and stockman—one is the large yield of pasture or hay that he can produce during the year, and the other is the high content of protein which lucerne contains. Lucerne hay of good quality carries so much of this important and usually costly element that 20 lb. of hay contains as much protein as is required in the balanced ration of an ordinary sized milch cow. Almost all of the coarse fodder grown upon the ranch is relatively rich in carbohydrates and relatively poor in protein. This is particularly true of the cereal hays, straw, corn fodder and the like. With these only the feeder cannot make a good ration, and what he needs to buy is protein. He usually buys concentrated foods because of their richness in protein, and also pays for them on the basis of their protein content. Were he able to raise lucerne or to buy it at a reasonable price, he could feed his cattle much more cheaply, and undoubtedly with as good results. This fact is brought out by comparing the relative cost of protein per pound as furnished by different foods.

We are not yet prepared to say that by the liberal feeding of lucerne concentrated foods may be dispensed with entirely. As a general principle it would seem that a small amount of grain could be profitably fed at all times. Much and careful experimentation is needed to decide the often-asked question, "Does it pay to feed grain with lucerne?" We hope to be able to undertake this experimental work in the near future.

Salt-bushes.

The salt-bushes have a two-fold value, in that they are not only valuable forage plants but can be cultivated in soils containing alkali beyond the limit of tolerance for any other plant of similar food value. Of these the ***Atriplex semibaccata*** is the only one which has received any extended attention in this State.

It is specially worthy of mention that while the salt-bushes differ materially botanically, and are not of equal adaptation, there is very little preference so far as chemical composition is concerned. But much further experimentation will be required before the same can be said of them physiologically, or with respect to nutritive values.

The choice of the best variety for a special locality would depend on soil adaptation and the results of feeding experiments.

Hays.—An examination of the analyses of the air-dried materials shows that the salt-bushes compare very favourably in nutritive value with the other hays. The average protein content, 12·89, is twice that noted for wheat hay, 50 per cent. more than the figure given for oat hay, and is only exceeded by burr clover and lucerne. The average percentages of fat and starchy matter in the salt-bushes are less than those found in cereal hays. But in the case of the latter nutrient, the average is almost identical with the figures named for lucerne and burr clover.

Digestibility.—As before stated, much more experimentation is required before we can definitely assert that these salt-bushes have as high digestive coefficients as lucerne and the ordinary hays. Feeding experiments are called for in this direction, and in some cases urgently so. [See *Agricultural Gazette*, July, 1906, page 701.]

In making up a ration we would assign to the salt-bush hay about the same digestive coefficients as those for oat hay. The digestibility would be greatly increased if the material were cut into small pieces, as it is a well-known fact that much more nutriment is derived from a given amount of fodder, more particularly by the horse and other solipeds, if it is cut up than if fed as harvested. This has been practically proved by many of the large livery stables, both here and abroad.

Feeding.—It is not advisable to feed the salt-bushes alone, particularly in the air-dried state, owing to the high percentage of saline ingredients, and the general uninviting appearance and condition of the salt-bush hay. In cases of emergency, however, sheep and cattle have existed altogether on this material through an entire season.

Mixed versus Unmixed Foods.—From the large number of favourable reports, it would seem that many of the failures were due mainly to irrational feeding. In some cases animals which had never seen the salt-bush were given quantities of the unmixed material and were expected to eat it with relish. Such a method of procedure is, to say the least, ill-advised. Any alteration in the food should be slow and gradual. It would be most unwise to substitute *A. semibaccata* for a cereal hay. The better plan would be to feed a very small amount of salt-bush with considerable hay; then increase by degrees the quantity of salt-bush and decrease that of cereal hay until the proportions are about equal. If the green salt-bush were used, then the hay should constitute about one-third of the roughage of the ration.

Utilisation of Straw.—The value of straw as a dilutant is becoming more appreciated every year. But it must be remembered that straw is dry, fibrous, and unpalatable, and consequently requires a succulent material to be used in conjunction with it. For this reason it is not desirable to feed the *salt-bush hay* with straw. The green, however, could very advantageously be utilized, more particularly if both feeds were cut up and well mixed. By this method the farmer is not only able to use alkali land which has been considered worthless, but can use in conjunction with the crop from this land another material which has been deemed of little feeding value. The economy of this plan is apparent without discussion.

Silage and the Salt-bush.—Silage could be fed profitably with either the green or air-dried salt-bush; in the latter case, the dryness of the salt-bush would be offset by the succulency of the silage. The amount of silage to be fed per day would depend greatly on the animals and the supplementary materials of the ration. The succulency of the fresh salt-bush would be preserved and the digestibility of some of its fibrous parts increased if it were siloed. With some other material a salty relish would thus be imparted to the silage.

Hawkesbury Agricultural College and Experimental Farm.

Notes from the Botanical Laboratory.

C. T. MUSSON.

Lucerne Rust.

This season the rust of lucerne (*Uromyces striatus*) has appeared freely through our lucerne patch at the Hawkesbury Agricultural College, both uredo and teleuto spores being freely present, the latter mainly on stems. The cluster cup stage occurs on *Euphorbia cyparissias* in the United States. This rust is quite distinct from the common leaf spot which is found everywhere. Lucerne rust has not been recorded here before, and, so far as we know, it is not recorded from Australia. From its extent now (April, 1907), it most likely has in reality been here some time and been overlooked.

Treatment for such an infestation resolves itself into rapid succession of close cuttings. No direct application would be of any use; but in cases where the trouble repeated itself year after year the crop should be ploughed under and a new patch sown.

In buying seed a change might be made in place of origin. Tamworth might replace Hunter River, or *vice versâ*, with advantage, giving a further chance to the crop in prospect, as we are following out by doing so the principles underlying "rotation"—in change of seed and change of ground.

Grape-vine "Sweet-Rot."

Amongst other things sent in for identification lately we have had a case of sweet-rot occurring on grape-vines from the Uralla district. Both leaves and fruits gave the characteristic *Botrytis* fruiting. As in most cases where a plant has begun to decay through some cause or other, the examples sent were simply smothered with numerous fungi, either parasitic or saprophytic.

Care should be taken where grape-vines are grown to burn all prunings, and to follow up systematically the plan of opening up the stocks after pruning to a depth of 3 or 4 inches; scrape off all loose bark, and swab or paint them with sulphuric acid, $\frac{3}{4}$ pint to 1 gallon of water. This will assist largely in fighting such vine troubles as Black Spot and the Sweet Rot.

Maize Rust.

Maize rust has been very prevalent this year, chiefly in the lowlands along the river flats; no doubt brought into prominence by the favourable showery weather that commenced about the end of January and

continued to the middle of March. Like the Cereal and other rusts, it is not an easy thing to combat. The chief points to observe are careful selection of seed and good cultivation. Change of seed is likely to assist in shaking the rust off during a season succeeding an attack. Change of ground, where possible, would certainly help to produce healthy plants and remove them from some chances of infection.

"Take-all" in Wheat.

It would seem that one of the forms of "Take-all" in wheat, as seen in the Cowra and other districts of New South Wales, is due to a stem-fungus parasite fully described by McAlpine in a recent number of the *Victorian Agricultural Journal.* The immediate cause is the fungus known as *Ophiobolus graminis,* resulting in the so-called Foot-rot, Black Leg, or Take-all.

The writer has not had the opportunity of seeing the infested crops; only odd examples of dried, dead plants having been submitted for examination. It is very likely that this trouble is more widely spread than has been hitherto supposed.

Where the roots die, eelworms will commonly find their way into the tissues. This has been observed in numbers of cases. They will not be the cause, but their invasion is an after effect.

Here, again, the only method of treatment is preventive. Selection of hardy suitable varieties and careful attention to the details of cultivation will minimise the trouble. Rotation is strongly advised. Oats, not being attacked, would make a useful change.

In all these cases of fungus attack the parasitic organism makes provision for tiding over the off-season period by means which enable it to take up its parasitic residence again on opportunities presenting themselves. Fallowing will not kill them out, the period not being sufficiently long to starve them to death. Moreover, side host-plants, in the shape of certain grasses, and possibly other plants for a time, will help to keep them alive when handy cereals are not present.

There seems little hope of getting rid of the cause. Our energies must be devoted therefore to breeding of hardy varieties, resistant to disease for the time-being. It would appear that we must look forward to this as likely to be always required, for it seems the only feasible way to shake off excessive loss. Hardy and resistant forms do not retain these qualities for ever; and so it is likely that the plant-breeder is going to be a much more important factor in agriculture than he has been in the past.

Largely through the influence of the late Mr. Farrer's work in wheats, this view of the matter has of late gained ground, and is probably now a firmly fixed item in the agricultural programme, and one that is capable of wider extension in practice.

One of the so-called Quinines of N. S. Wales.

(*Petalostigma quadriloculare.*)

J. H. MAIDEN.

Petalostigma quadriloculare (F.v.M.) is a small tree of northern New South Wales and Queensland, and goes by the names of "Crab Tree," "Native Quince," "Emu Apple," "Bitter Bark," "Native Cinchona," "Quinine Tree," "Muntenpen" of some Queensland aborigines, "Tronganongan" of the Port Curtis blacks, according to Mr. Hedley.

The bark contains a very powerful bitter, said to have the same properties as Cinchona.—(Hill).

Tenison-Woods, however, states ("Explorations in Northern Australia"):— "It is usually covered with fruit like a small yellow plum, of eminently nasty taste. This is, I believe, its only claim to be called a 'quinine'." This surmise is hardly correct. The colour is of red tomatoes, in ripe specimens. The colour, in fact, varies from yellow to red. The stem-bark is said to contain, together with the ordinary plant-constituents, a camphoroidal essential oil, and an indifferent bitter principle belonging to the glucosides, but Dr. Joseph Bancroft states that its bitterness is due to a peculiar tannin. Dr. Thomas Bancroft informs me this bark is physiologically inert, or practically so.

The ash of the bark is 8·3 per cent., and an analysis is given by Falco, Watts' Dict., vi, 1st Suppt., 904.

Armit (*Proc. Linn. Soc.* [Bot.] xx, 69) states that it a useful remedy in fever, low or intermittent; ten-grain doses of the dried bark three times per diem often producing a favourable result.

"It is one of the best tonics I know of. I use it often, especially the kernels. I believe it is as good as pepsin for giving an appetite."—(Mr. McGregor.)

It will thus be seen that this bitter bark had more or less local reputation as a medicinal agent.

The Forest Department, some years ago, sent the bark to the Imperial Institute (through the Agent-General), and the following report from Mr. Wyndham Dunstan, Scientific Director of the Institute, came to hand a few days ago.

Sir, Imperial Institute, London, S.W., 23 January, 1907.

In reply to your letter of the 9th instant, I have to inform you that the physiological tests of the bark of *Petalostigma quadriloculare* have just been completed. The results of the investigation show that preparations of the bark do not exert any marked physiological action. In consequence, it does not appear that the bark can be utilised for any important medicinal purpose.

The investigation has occupied considerable time, owing to the difficulty of isolating the alkaloid, which is only present in minute amount in the bark, and to the necessity for conducting the necessary experiments on the physiological action.

The Agent-General for New South Wales, WYNDHAM R. DUNSTAN.
123–125 Cannon-street, London, E.C.

It will be seen that the report confirms the investigation of Dr. Thomas Bancroft, of Brisbane, and thus another New South Wales reputed drug is proved to have no practical value.

The Goat.

(From the *Journal d'Agriculture Pratique.*)

AMONG our domestic animals there are two groups: one we may designate as the "aristocracy," the other as the "common herd." Whilst the horse and the sheep belong to the former, the ass and the goat are classed with the second; for a simple reason—the horse and sheep are not so hardy as the others, and require much more care. The ass and goat can accommodate themselves anywhere; the poorest shelter suffices for them; they require no care, and are in consequence fated—as we may say—to be employed only by those who cannot afford anything better; being despised by those who could provide them comfortable quarters. In consequence, although they have lost some of their piimitive beauty, they have gained an independcnce of character which has become proverbial.

Angora Goats.

The saying "Head like an ass; tricky as a goat," is very frequently used, and it has even been suggested that the capricious nature of the goat may be transmitted through its milk, and this has been known to create a prejudice against the use of it for children, for whom it is especially suited.

It is, above all, as a milk producer that the goat is particularly to be recommended. Contrary to the general belief, goat's milk has no disagreeable smell, such as is commonly attributed to its skin, any more than the milk of a ewe gives an odour to its flesh. It has three advantages—its abundance; its similarity to woman's milk; and its complete freedom from the dreaded microbe of tuberculosis. It is, consequently, more economical than cow's milk, more digestible for infants for whom mother's milk is not available, and healthier for everybody for whom the use of milk is recommended. This latter consideration is of the very highest importance. Robust, and accustomed to live in the open air, the goat never suffers from tuberculosis; and

so well is this fact recognised that injections of goats' blood have been recommended as a preventive of phthisis, and even as a cure for it. The cow, on the contrary, is deplorably susceptible to this disease; the microbes pass into the milk, and unless this is boiled, it spreads the seeds of tuberculosis throughout the intestines of the victim. This is the most frequent means of contagion, and the most to be feared, as it produces the most rapid form of the disease, such as is known as "galloping consumption."

Goat's milk is, therefore, in most cases where physicians order a milk diet, very superior to cow's milk, and on that account the breeding of goats is everywhere to be recommended. There exist many types, many being entirely without the characteristic goat-odour, and it is to these that preference should be given. They should be suitable for killing for their meat, and for this purpose the Angora is especially preferable, its flesh having a most delicate flavour, whilst, unlike the hair of our indigenous goat, which is rough and hard, its coat is fine and silky, and forms beautiful material. It is, therefore, for many good reasons that M. Crepon has undertaken the rehabilitation of the goat. This despised race has hitherto been the subject of many prejudices. If the ancients gave to the satyrs of unpleasant renown, horns, hoofs, and a tail, such as are generally attributed to a demon, at this day many sensible people believe that every branch of a tree which is touched by the teeth of a goat is certain to die. The fact is this: In default of herbage or leaves, the goat attacks the bark, and the leaves soon die. But this is only in arid places, where vegetation is always poor and scanty, and the animal must find a living somewhere. But goats living in abundance are no more dangerous in this respect than sheep.

One other question remains: that of keeping troops of goats. It is unfortunate that in mountainous regions they cause much ruin through clearing the land little by little of all vegetation and trees, which causes the soil to be washed away to the foot of the mountains. They, like sheep, eat the herbage so close that they may truly be accused of causing in some parts entirely deserted districts. It is not M. Crepon's desire to form vast herds of devastating goats. He simply asks for the animal a place on the farm, as one of the aids to a profitable industry.

THE above is the preface by M. Perrier, Director of the Museum, Member of the Society of Medicine, and President of the National Society of Acclimatisation, to M. Crepon's book on "The Goat: Its history, practical breeding, and the benefits derived from its use." M. Crepon is a contributor to the *Journal Pratique*, and his book can scarcely be praised too highly. It is one of the finest and most complete descriptions of this animal which have ever been published. M. Crepon has undertaken the rehabilitation of the goat, and in his book just published nothing has been omitted. History, varieties, geographical distribution of races, zootechny, breeding, and diseases, are all treated with care and knowledge. It is hoped that this splendid work may commence a new era in the history of a too much despised, but valuable, race.

Manufacture of a Good Keeping Cider.

(From the *Journal d'Agriculture Pratique.*)

THE attention of apple-growers should be directed to the necessity for making cider in years of abundant harvests, which will keep in first-class condition for several years, that is to say, from one period of plenty to another. The cider industry cannot prosper unless the article can be sold at a fairly constant price, one not fluctuating according to good or bad seasons. The importance of these variations will be understood when we state that the production, which amounted to 4,000,000 francs in 1903, rose to 36,000,000 francs in 1904, and fell to 4,000,000 francs again in 1905. Such fluctuations immediately make themselves felt in the varying prices of apples, which oscillate from £1 to £8 per ton.

How, under such conditions, can the cider manufacturer always supply a product of unvarying price and quality, unless a good-keeping cider can be made in years of abundance, to be placed on the market as required?

Up to the present the process of manufacture and the construction of the keeping cellars do not usually allow of its conservation longer than five or six months; while in order to meet the requirements of customers who prefer a sweet cider, the only means used at present is to sweeten the dry cider at the time of sale. This proceeding has many disadvantages. The sugar increases the price of the cider, unless it be considerably diluted. Besides, dry ciders are often affected by acetic bacteria, and in spite of being re-sweetened they become more and more acetic; added to which these re-sweetened ciders have seldom any fruity bouquet, this having been lost at the end of the first fermentation. It, therefore, becomes a matter of necessity to find a more efficient method of preserving sweet cider for a long period, and we will describe a new process which gives excellent results. It is based on the knowledge we possess of the physiology of cider ferments. Pasteur has shown that in fermenting a liquid in vacuum, with traces of must, the fermentation can be made interminable, that is to say, to have, after fermentation, a sweet liquid remaining.

We have repeated Pasteur's experiment, and consider that the best means of obtaining a sweet cider, is to use a very pure apple must, and only have a limited quantity of ferment, placing it in vacuum during the whole process of fermentation. Under these conditions the fermentation ought to cease before the sugar has completely disappeared, and in withdrawing it from vacuum it should be possible to obtain a sweet cider which will keep indefinitely and possess all those qualities obtained by fermentation. Experience shows that this view is correct and that we have found a new process.

The following shows the details of our procedure in the laboratory. Cider obtained after a strong fermentation, drawn from between the top and bottom lees, and very clear, was placed in a vessel of special shape; this was placed in a very cold cellar, where the temperature did not exceed 10 degrees (Centigrade). This cider contained very little ferment, the largest quantity

remaining at the top and bottom in the lees; consequently, fermentation went on very slowly, on account of the low temperature of the cellar. By-and-bye there were pectic, tannic, albuminoid and mineral precipitations which carried with them a portion of the ferments in the liquid, and which settled in the conical bottom of the vessel. Then a tap is opened, and both the precipitates and ferments are drawn off, care being taken to prevent any air entering the vessel through the water syphon, which is accomplished by passing a current of carbonic acid into the apparatus by means of an upper tube, when the excess of gas escapes by means of a syphon. The same phenomena again take place in the vessel, and the process is repeated until nearly all the ferments in the cider have been removed, that which is left, being produced in vacuum, is incapable of transforming the sugar into alcohol and carbonic acid, leaving a sweet cider, which is the result we wished to obtain.

Instructions for Making Cider.

1. Let the apple-must, when flowing from the press, run into a barrel or other vessel, and let the coagulation of the pectic matters take place at a low temperature, say 4 or 5 degrees C. When coagulation is finished, allow the cider to ferment slightly, and form the lees.

2. Withdraw the clear liquid without allowing it to come into contact with the air, and place it in a fermentation vessel. This is a cylindrical vessel of conical shape, with an opening and tap at the bottom. This vessel is entirely closed at the upper part, but has three or four tubes; one carrying a tube with a cock, which can be put into communication with a carbonic acid apparatus; another is closed by a water syphon and has a cock; the third tube has also a cock. Finally the apparatus may be fitted with a pressure gauge, if constructed to stand a certain pressure of carbonic acid. The cylindrical part of the apparatus can be fitted with glasses and cocks, which are used for observing the clearness of the liquid; and also a thermometer to show the temperature. The apparatus can be made of either glazed cement, varnished wood, or tinned metal. All metallic parts should be covered with the purest tin, and the whole apparatus is placed in a special frame which will permit of all the operations described to be easily carried out.

When the vessel has been well washed with boiling water, or is sterilised by steam, it is filled with carbonic acid gas; and afterwards with cider, which can be put in from the top or the bottom—the latter for preference—by pumping the air out at the top. When the vessel is perfectly full, there will be nothing left but cider and carbonic acid gas in it.

If these instructions are followed, a clear sweet cider is obtained, which has retained all the fine bouquet of the fruit, and containing carbonic acid gas. This cider can be delivered in casks or bottled, and can be kept almost any length of time. It has no taste of the lees, nor the certain bitter taste which many ciders acquire at the end of the fermentation. It does not darken, because the must has not been in contact with the air, and the liquid remains at a very low temperature during fermentation.

Semi-Arid America.

ITS CLIMATE COMPARED WITH THAT OF SOUTH AUSTRALIA.

THE great interest taken in the subject of dry-farming, which has been aroused by articles on the subject in the leading magazines and newspapers of America and Australia, has in a great measure been very misleading to many who believed that the dry west of New South Wales, Northern Victoria, and South Australia—areas of limited rainfall and extreme heat during summer—were similar climatically to what is termed the semi-arid districts of the United States.

As the climate of South Australia is familiar to many residents of New South Wales, and is similar to that extending over a large area of this State, the following article by Mr. W. L. Summers, which appeared in a recent issue of *Journal of Agriculture* of South Australia, will be read with great interest:—

In view of the great interest which has been manifested in the reports of wheat-growing in the semi-arid districts of America, and especially in the Campbell system of dry-farming, a comparison of the climatic conditions of South Australia and that portion of the United States of America coming under the definition of semi-arid, will doubtless be of value in helping readers to decide to what extent the American results can be applied to our own conditions. How many South Australians know what is meant in America by the term "semi-arid"? Most of the information published in these States during the past ten years has been based on popular articles from American magazines, or from Mr. Campbell's brochure on "Tillage"; and as the original writers take it for granted that their readers are aware of the conditions of the district referred to, very little information on the subject is given. Even a careful study of the various official reports and bulletins in the libraries of the Agricutural Department and the Observatory fails to reveal an official definition of the term that has any exactness.

In the following lines, however, I will endeavour to convey some information gleaned as to the climatic conditions of both the "semi-arid" and "arid" districts referred to. In the 1900 "Year Book of the U.S.A. Department of Agriculture," in an article on "Successful Wheat-growing in the Semi-arid Districts," Mr. W. A. Carleton says that there is no general agreement as to what part of the country may be properly termed semi-arid, and what part is completely arid. He, however, applies the former term to "that portion of the Great Plains between the 99th and 102nd meridians." This strip of country includes nearly half of Nebraska and Kansas, and practically all North and South Dakota. The adjoining States of Montana, Wyoming, Colorado, and Arizona are included in the "arid" districts. Taken as a whole, the semi-arid and arid States comprise an elevated tract of country stretching away from the eastern slopes of the Rocky Mountains. The winter is very cold, dry, and bleak; snow

lies on the ground for a long period, and blizzards are not rare. On the other hand, the summer is wet, the range of temperature considerable, but lower than we experience in our inland districts. There is often much cloud during the summer, and generally in the semi-arid districts there are no extended periods in the summer without rain—at least, not in comparison with South Australian conditions.

The official rainfall map of this portion of America shows that the average precipitation over the greater part of Nebraska and Kansas exceeds 20 inches; while there is only a very small proportion receiving less than 18 inches. South Dakota has over 18 inches in all but a small portion of her territory; while in North Dakota not more than half the country receives less than that amount. In Wyoming, Colorado, and Montana the precipitation is much less, tapering away from 17 inches to less than half that amount in some parts: but in the driest districts in these States where cultivation is carried on it is mostly with the aid of irrigation.

Let us deal in more detail with the three States classed as semi-arid, leaving out Kansas, as only a small portion of this State receives less than 22 inches of rain. Nebraska is officially described as a region of rather limited rainfall, "*but occurring mostly in the summer when the crops are growing most rapidly.*" Its rather limited rainfall varies, however, over two-thirds of its territory from 20 to 30 inches, consequently we would hardly call it semi-arid. The fact that the wheat yield averages about 14 bushels over an area of more than 2¼ millions of acres, while the area under maize in 1904 was nearly 8 millions, and the average yield about 33 bushels, is significant of the climatic conditions of this State. The two States of North and South Dakota are classed as a vast undulating plain, varying in elevation from 1,000 feet to 8,000 feet or more in the west as the Rocky Mountains are reached. As before stated, the climate is very cold and dry in winter, and little wheat is sown until early spring, say April. The summer is wet and moderately hot, and the crop grows rapidly, the harvest taking place about the end of July. In regard to temperature (shade), the maximum range in 1903 appeared to vary during the growing period from about 75° Fahr. to 100° Fahr. There is, however, a greater variation in actual temperature than usually experienced during the summer in South Australia; owing, doubtless, to its elevation, it is often extremely cold. The question of temperature, of course, gives rise to another phase of the subject—*i.e.*, evaporation. So far as can be learned, the maximum average evaporation is from 60 to 70 inches per annum over a free surface of water. In Adelaide it is 55 inches, at Alice Springs nearly 100 inches, so that it is within reason to assume that at such places as Orroroo, Petersburg, and Carrieton it would range about 80 inches. It is true that a greater proportion of the evaporation would occur in the Dakotas during the growing season than in this State, as our wheat is off the land by the middle of summer; but against this must be set the fact that in the Dakotas the extreme periods without rain occur mostly in the autumn, winter, and spring, and very rarely exceed thirty days in South Dakota or forty days in North Dakota. The area of these two States is about 150,000 square miles, and the total area of wheat crop in 1904 was over 7¾ million acres, and the yield 85,448,977 bushels—an average of nearly 11 bushels. The two principal factors determining the yield, apart from the question of cultivation, are stated to be the summer rainfall of June and July, and hot winds and heat late in the summer.

That the American farmer is not altogether exempt from severe drought troubles, similar to those through which the inland districts of Australia passed a few years ago, the following extract from an official report is evidence:—

"It may now be said that the great drought, which for several years afflicted the interior of the continent, a large portion of the Rocky Mountain region, as well as the whole Mississippi Valley, has been broken. The extent and severity of the great drought have not been generally understood. The drought began as early as 1887, and was not generally checked till the winter of 1890 and 1891. It reached its climax in the season of 1890, when the wheat crop of the United States was cut down almost 100,000,000 bushels below the preceding year, which latter itself had been greatly shortened by drought; the corn crop, 600,000,000 bushels; the oat crop, 230,000,000 bushels; and other great crops, like hay, potatoes, &c., in similar degree. The drought was felt through all these years, in varying degrees of severity, from the gulf coast northward over all the States bordering the Mississippi and Missouri Rivers far into the British possessions. It shortened crops in Illinois and Iowa materially, and it was more severe in Kentucky, Tennessee, and especially in Arkansas and large portions of Missouri. But the fierce brunt of the drought fell upon that vast strip of plain country which lies west of the 97th meridian of longitude, including the western two-thirds of North Dakota, South Dakota, Nebraska, Kansas, Indian Territory, New Mexico, and the major portion of the great State of Texas. Throughout this region the drought was general, although much more severe in one locality than in another. In extensive areas crops were total failures, and even in other areas which are exclusively devoted to grazing, grass was almost burnt up, and water disappeared. In many places where the Government surveys have marked the meanderings of extensive lakes or marshes, as in some localities in South Dakota, and where such had been known to exist up to 1887, the water totally disappeared."

Readers will doubtless have noticed in American reports references to "spring wheat" and to "winter wheat." The former are the wheats sown in early spring, and harvested in the middle of summer; the latter are sown at the end of autumn, and in those districts where both classes of wheat are grown, ripen but a short time before the spring wheat. The relative proportion of these two classes of wheat grown in the United States is, roughly, three of winter wheat to two of spring wheat, North and South Dakota and Minnesota being the great spring wheat districts, the total yield for 1904 in these States being 153,800,000 bushels.

Summarised briefly, then, the main differences between the climatic conditions of the semi-arid districts of America and what we call our dry districts are as follow:—

South Australia.—Where our average rainfall exceeds 15 inches, the district is regarded as a safe one for wheat and sheep, while our "dry wheat areas" would average, say, 10 to 15 inches. The elevation above sea-level of these dry areas is from a few hundred to nearly 2,000 feet. The winter is somewhat cold, often frosty, with lengthy intervals between appreciable falls of rain. The spring is relatively dry, and hot, drying winds while the wheat is flowering often cause serious loss. The average summer temperature is high, and frequently the shade records reach 100° Fahr. for a week at a time. The wheat is sown at the beginning of winter, has to make its growth during relatively cold weather, and mature its grain in the hot, dry months of late spring and early summer.

America.—The rainfall of the so-called semi-arid districts appears to be from 18 to 20 inches. The altitude is from 1,000 to 8,000 feet; winter is cold, but dry. The summer is wet and warm, and extended periods without rain are rare. The wheat is sown in spring and harvested within about 120 days, and during the whole of the growing period relatively high temperatures rule, though, as previously pointed out, extremely cold weather is frequently experienced. Evaporation is consequently considerably less than in South Australia, and the frequency of the summer rains, even when limited, tends to replenish the losses by evaporation.

It will therefore be seen that the contrast between the climatic conditions of the two countries is very marked, and that results in the American States can scarcely be compared with local results. Our experience with the so-called drought-resistant wheats which have been introduced into these regions during the past eight or ten years has been that they keep on the ground too long—that is, make but little upward growth until the warmer weather sets in, and then too often before they mature their grain they are caught with hot winds. On the other hand, except in the coldest districts, our ordinary wheats make considerable growth before the spring sets in, and thus have more prospect of maturing their grain.

Export and Cold Storage Branch.

H. V. JACKSON,
Department of Agriculture.

THE following particulars of the imports into the State of New South Wales, during 1906, of eggs, live poultry, and frozen poultry, and also the export of the same products from the State, have been supplied to this Department by Mr. Baxter, the Acting Collector of Customs, Sydney:—

Whence Imported.	Eggs.		Live Poultry.		Frozen Poultry	
	Doz.	£	No.	£	No.	£
Victoria ...	31,874	1,062	166	51	39,947	1,451
Queensland ..	125,988	4,196	319	81	3,329	126
South Australia	934,132	33,611	12,666	2,952	...	...
West Australia	... ..	...	42	10	...	..
Tasmania ...	.. ..		125	29	874	27
	1,091,994	38,869	13,318	3,123	44,150	1,604
Imports from Oversea—						
New Zealand ...	453	13	67	274	...	..
United Kingdom ...	5,660	208	96	412	..	..
Hong Kong	3,316	81	...	.	276	10
Germany ...	5,592	143	...	...	.	..
Norfolk Island	.....	...	1	1	...	...
United States of America	..	..	32	19	.	..
Oversea totals	15,021	445	196	706	276	10
Grand totals	1,107,015	39,314	13,514	3,829	44,426	1,614

EXPORTS.

Countries.	Live Poultry.		Frozen Poultry		Eggs.	
	No.	£	Pairs.	£	Doz.	£
New Zealand ..	846	1,116	...	...	7,316	542
United Kingdom	7	7	568	152	..	..
Ceylon ...	18	47	..	.	...	...
Fanning Island	26	9	...	..	132	6
Fiji ...	475	89	...	..	576	18
Hong Kong	150	40	120	28	...	...
New Guinea	52	21	...	..	..	...
Ocean Island ..	62	11	..	...	465	20
Caroline Islands	7	2	...	..	...	...
Kaiser Wilhelm's Land	7	3	...	...	..	..
Marshall Islands	163	39	...	...	60	3
Neu Pommern (New Britain)	78	15	..	...	506	28
New Caledonia	33	21	...	..	...	...
New Hebrides ...	73	13	...	...	...	.
Philippine Islands	68	20	3,297	809	..	...
South Sea Islands	195	37	...	...	994	46
United States ...	6	18	..	...	72	3
Cape Colony ...	...	...	3,162	737	30	1
Natal ...	....	...	3,614	1,573	144	5
Straits Settlement	... ..	...	1,277	432	...	..
Vladivostock ...	......	...	100	20	...	...
Total ...	2,266	1,508	12,138	3,751	10,295	672

It will be seen from the above that the importation of eggs into New South Wales reached a total of £39,314 in value in 1906; live poultry, £3,829; and frozen poultry, £1,614. £38,869 worth of the eggs were received from other Australian States, South Australia being the largest supplier, sending 934,132 dozen eggs, valued at £33,611. South Australia also supplied the largest quantity of live poultry, viz., 12,666 head, value £2,952; Victoria, however, supplied most of the frozen poultry imported, sending 39,947 lb. weight, value £1,451.

The exports from the State of New South Wales of live poultry, frozen poultry, and eggs were small, live poultry shipped abroad being 2,266 head, value £1,508; frozen poultry, 12,138 pairs, value £3,751; eggs, 10,295 dozen, value £672. New Zealand took the greater portion of the live poultry and eggs shipped, viz., 846 head, value £1,116, and 7,316 dozen eggs, value £542.

In frozen poultry, £152 worth were shipped to the United Kingdom and £1,573 worth to Natal. The frozen poultry shipped to Cape Colony were valued at £737. The shipments to the Philippine Islands totalled £809.

Weather Conditions during March, 1907.

A. NOBLE,
Officer-in-Charge, Meteorological Department.

THE month opened with a monsoonal disturbance extending over our inland districts which gave rise to a useful rainstorm. Showers first commenced to fall early on the 2nd, and rapidly spread northward and westward, associated with thunder. Some good falls occurred on the 3rd, in many cases exceeding 2 inches on north-western slopes, Hunter and Manning, central tableland, and south coastal districts. On the 4th the disturbance had retreated westwards, causing a temporary suspension of the unsettled conditions in our State; but towards evening it returned, and resulted in widespread and extensive thunderstorms, affecting at least two-thirds of our State, and also Victoria. In many cases these thunderstorms did a great amount of damage, particularly about the Wellington and Moss Vale districts. At Bodangora, in the former district, it came from the north-east, and was of the nature of a whirlwind, and although it only lasted five minutes it did a considerable amount of damage. The roof of the school building was blown 50 yards away and weather sheds lifted 10 yards. The track of the storm can be clearly traced by fallen trees, monster ones being carried 50 yards. At Moss Vale, the heavy hail was also very destructive, the public school there having most of its windows broken. On the 5th the coastal parts, especially between the Manning River and Wollongong, were visited by a heat wave, when the thermometer went up to over 90 degrees at many stations, but was followed during the next day by a cool change and fine pleasant weather generally, which continued until the 9th. On that date monsoonal influence began to assert itself, resulting in light to moderate rain over the tributaries of the Barwon and on highlands and coastal parts. The monsoonal conditions intensified by the 13th, forming a trough, extending from Queensland into northern parts of New South Wales. These conditions resulted in good rains over our State, particularly in Northern districts, where as much as 524 points fell at Hungerford, on the 13th. This rainstorm continued over New South Wales more or less generally until the 18th, and was responsible, in the aggregate, for some heavy totals, chiefly confined to the north-eastern half. The following are a few of the heaviest:—Forster, 910; Seal Rocks, 814; Raymond Terrace, 755; Katoomba, 728; Byron Bay, 712; Sydney, 700; Tweed Heads, 652; Port Stephens, 624; Hungerford, 560; Manning Heads, 562; Walcha, 547; Lawson, 547; Kurrajong, 506; Boggabilla, 545; Barraba, 480; Millie, 466: Collarendabri, 427; Inverell, 472; Mogul, 468; and Yetman, 451 points.

On the 19th a storm of cyclonic characteristics appeared in the south-west portion of Victoria, with its centre about Portland and its outer isobar in western New South Wales. This storm first put in an appearance on the north-west coast of Western Australia on the 14th, and was attended with violent winds and good rains over the gold-fields as it travelled south-eastward. By the

time it had reached the southern portion of South Australia the rain area had considerably contracted, although its winds were still strong. Travelling at a normal rate it reached the western districts of Victoria on the 19th, and thence over New South Wales, causing fresh to strong winds and rough seas on the Victorian and our south coast, but only light rains over the greater part of the State, the chief benefit being received by the north-eastern districts, as in the previous rainstorm. On the 22nd finer conditions ruled under the influence of a "high" centrally situated over the Great Australian Bight. This "high" remained practically stationary until the 26th, when it intensified, causing strong and cold southerly winds and rain on our coast. At Sydney, on the 27th, the lowest temperature, viz., 51·4, in March for twenty-one years was recorded. Thence fine and warm weather continued for the remainder of the month.

The following statement shows briefly a comparison of the chief meteorological elements over India, together with Australia, as far as data are available, for the month of March, 1907:—

	Departure from normal.		General Conditions (referring to State as a whole).
	Pressure	Temperature.	
India ...	+ ·02	− 2·0	Wet.
Sydney ..	− ·05	− 1·5	North-eastern half moderately wet; south-western half dry.
Melbourne .	− ·03	− 3 2	Dry.
Adelaide ..	·00	− 4 9	Dry, especially in North Adelaide.
Perth .	− ·05	+ 2·0	Slightly below normal.
Brisbane	− ·07	+ 0·4	Moderately wet.

During the month of March the rainfall received in our State was above the average over the Paroo, Warrego, and Upper Barwon tributaries, also over the north highland and coastal parts extending as far southwards as the Blue Mountains and Moruya River Heads. The greatest registrations occurred on the Paroo, north-western slopes, and parts of the north coast.

Over the south-western half of the State the rainfall was generally below normal; the greatest defects occurred over Riverina, south-western slopes, and southern tableland.

The following table shows the distribution of the falls in percentages above or below the average over the different subdivisions of the State:—

		Percentages.		
		Above.		Below.
Over North Coast	from	146	to	24
Hunter and Manning	,,	172	,,	11
Metropolitan Area	,,	23 to 61	...	—
South Coast	,,	44	to	68
Northern Tablelands	,,	216	,,	7
Central Tablelands	,,	74	,,	74
Southern Tablelands	,,	6	,,	81
North-western Slope	,,	9 to 215	..	-
Central-western Slope	,,	136	to	77
South-western Slope	,,	—	...	15 to 82
North-western Plain	,,	13 to 189	..	—
Central-western Plain	,,	99	to	75
Riverina	,,	—	...	25 to 90
Western Division	,,	261	to	97

Seasonable Notes.

GEO. L. SUTTON,
Wheat Experimentalist.

PLANTING is the operation of the present month, and whilst it should be pushed on with all vigour during favourable periods, it is advisable to delay it rather than plant in wet or badly-prepared soil. It is now recognised by our most successful farmers that, with the exception of the cultivation which immediately precedes the planting, the preparation of the soil should be completed before planting season commences, so that the most important operation of the year is neither delayed nor hindered. In normal seasons this is only possible on farms where the practice is in accordance with a definite plan, and where a certain area of the farm is cropped each year, and where the portion cropped with wheat is preceded by a summer fallow. It is to the advantage of every farmer to systematically plan out his work, and to arrange to crop a definite area regularly rather than to allow the peculiarities of the season determine the area under crop. When such a practice becomes common, the element of speculation now considered to be inseparably associated with wheat-growing will be largely eliminated.

Unless rain falls after planting, germination is stimulated and hastened by rolling. This, at present, necessitates a separate operation, which, whilst beneficial, would be unnecessary if press drills were in common use. The advantages of these implements for our dry districts are so obvious that farmers should agitate for their introduction. If a demand for these implements sets in, the manufacturers will take steps to cater for it. Agricultural societies, and particularly the Royal Society, could help to introduce these desirable implements by offering substantial prizes for those possessing satisfactory qualities.

Combined with the fact that many millers refuse to purchase Allora Spring, the announcement of Mr. Chicken, of Netherby Mills, Corowa, to the effect that, on account of the unsatisfactory quality of the flour produced from it, he does not intend, in the future, to purchase the variety Blue Stem, or Dart's Imperial, is the advance note of warning to farmers that the time has arrived when the ability of a variety to yield well is not a sufficient recommendation for its adoption or retention. In addition to yielding well, suitable varieties must, in the future, also possess the ability to produce flour of fair strength. Varieties in the same class as Dart's Imperial, the wheat referred to by Mr. Chicken, are—Farmers' Friend, Steinwedel, Hudson's E. P. Straw, Rattling Jack, Fill-bag, White Tuscan, Common Purple Straw. Varieties producing flour

of better, and, at present, of satisfactory strength, are—Jonathan, Bobs, Comeback, Manitoba, Tarragon, Cleveland, John Brown, Sussex, Blount's Lambrigg, White Lammas, and Federation. Whilst the risk of producing a smutty crop from "unpickled" seed planted early, and in dry soil, is not serious, the same cannot be said of seed planted during the present month in moist soil. It is, therefore, advisable that all seed which is not known to be free from smut spores should be "pickled"; the advantage of supplementing the bluestone treatment with that of lime is again emphasised.

The treatment recommended is to immerse the seed in a 2 per cent. solution of bluestone for five minutes. Whilst in the "pickle" it should be well stirred about with the hand or a wooden implement, and the smut balls which float on the surface removed. After immersion in the bluestone solution, and when the wheat has drained, it should be dipped in lime-water, or sprinkled with air-slaked lime. By a 2 per cent. solution of bluestone is meant 2 lb. of bluestone dissolved in 100 lb.—*i.e.*, 10 gallons—of water. Lime-water, for farmers' use, is made by slaking 2 lb. of fresh lumpy quicklime in 20 gallons of water.

Mr. Treloar, a South Australian correspondent, writes as follows concerning the suggestion submitted for consideration in the March *Gazette* :—"The practice of pickling every two years is fairly common—that is, if the crop from pickled wheat is quite free from smut; this agrees with your recommendation." This comment is very interesting, and shows that the principle underlying the plan suggested is to some extent in operation in South Australia, and that it is within the realm of practical agriculture, and in consequence can be adopted with confidence. This plan, in addition to being an economical method of providing smut-free seed for farm use, also furnishes the best and cheapest method of regularly raising the seed required for the farm in such a way that it will not "run out."

On account of the known instances of seed-grain being sold under a name to which it had no right, it is necessary that farmers, when introducing a new variety or renewing the seed of an old one, should obtain seed about which there can be no doubt as to purity. To purchase the large quantity required for the main crops would involve considerable expense, which in most cases would be unwarranted. With the plan as outlined in working order, a farmer could, in a single season, with a very slight outlay for pure grain of the best quality, produce sufficient seed to plant his main crops. It is believed that the plan of regularly introducing a small quantity of fresh seed each year could, with advantage, be adopted.

For late sowing late in May or early in April, two new early varieties, Bunyip and Firbank, have proved themselves worthy of extended cultivation.

Bunyip is the result of a cross, made by the late Wm. Farrer, between Rymer and Maffra. It is very early, being about a week earlier than Federation, and about a fortnight earlier than Steinwedel. On account of its extreme earliness, it should not be sown before the end of May. It is not rust-resistant; but being such a quick maturer it is likely to escape damage by this pest. It has a short straw and produces a large plump berry. When growing, the crop has a very attractive appearance. The result of one milling test shows that it has a strength of 52 and a gluten content of 11½ per cent. These figures indicate that its milling value is better than the majority of our soft wheats, and on this account it seems admirably suited to replace Steinwedel, or other early soft varieties which are grown for grain, the short straw of Bunyip rendering it unsuitable for hay. Last season at the Cowra Experimental Farm it produced—When planted 14th April, 7⅝ bushels per acre; when planted 20th May, 11 bushels per acre; when planted 4th July, 22⅓ bushels per acre.

Firbank is an early wheat, apparently more suitable for hay than for grain. To obtain this variety, Zealand (or Berthoud) and Maffra were crossed. The late Wm. Farrer made this cross with the object of producing an early variety having the desirable qualities of the well-known Zealand for hay making. From our limited experience with this variety, it appears quite as prolific as its parent Zealand, and has the advantage of being about fourteen days earlier. A mid-season sowing made on 20th May, 1906, yielded at the rate of 2½ tons, and a late sowing made on 4th July, 1 ton 16 cwt. of hay per acre.

Orchard Notes.

W. J. ALLEN.

May.

Planting young Orchards.—Where young orchards are to be planted this season the work of preparing the ground should be pushed on as rapidly as possible; that is, the land should be cleared, well fenced, ploughed, and subsoiled, and wherever irrigation is to be practised the land should be graded so as to facilitate the running of the water.

Wherever it is necessary to enclose the orchard with wire netting, and I am sorry to say that this precaution is necessary in a good many parts of the State, it is best to use a good wide netting with small mesh at the bottom, as it is wonderful through what a small mesh a young rabbit will get as well as how high a fence he will scale; therefore, if the orchardist wishes to preserve his trees from the onslaught of these pests he must see that the orchard is securely enclosed.

Lay out the orchard properly, giving the trees plenty of room so that there will be a sufficient area from which they can draw moisture to keep them in good growing condition during dry years.

At time of planting cut all apple and pear trees down to within a foot of the ground, and other fruit-trees to within 15 inches. There is nothing like a good low-headed tree which lends itself naturally to the arts of the pruner, sprayer, picker, &c., nor does it suffer so severely as the higher trees from the effects of high winds, the trunks do not sun-scald, and it is in every way a most desirable tree to have.

Refilling old Orchards.—Refills in deciduous orchards should be planted as early as possible.

Citrus Orchards.—The orange crops this year are exceptionally good, and a number of our growers are talking of testing the European markets. I think Canadian and American markets might be tried also, as fruit was commanding very high prices during my visit last season, and prices are good again this year; but there would be no use in sending anything there but absolutely clean fruit. Both lemons and oranges are in good demand there during the months of July, August, and September.

Nursery Stock.—The wraps on all budded nursery stock may be removed any time now.

Passion-fruit.—Keep the fruit picked up as it falls, as it is then in its best condition; grade it nicely, and pack it in rows in the boxes. If growers are exporting any other fruits it would be a good plan to send a few cases of passion-fruit along, in order to test their carrying quality,

as if once we can successfully land this fruit in the markets of the Old World and get it well introduced there, there should be an unlimited market for it, and there are thousands of acres of land near the coast on which this plant does well, and where, with proper attention, it produces heavy crops of fruit annually.

Prunes.—The crop has been a good one this year, but, as with other fruits, they were late in ripening; but the sample of the dried fruit is the best we have had for several years.

Sultanas and Raisins.—Owing to the very cool season these fruits were very late in ripening, and some difficulty has been experienced in curing them. The crops were good and the quality about up to the average.

Evaporator.—We have had erected this season at our Wagga orchard, an evaporator, which gives promise of doing excellent work. Unlike most other evaporators the air is kept in circulation by means of a fan, which draws the air over a coil heated by steam and over the fruit at the rate of about 10 miles per hour. The fruit is put into the evaporator at the end furthest away from the steam coil which is the coolest part of the evaporator, which is 64 feet in length, about 3 feet high, and wide enough to take a 2-foot wide tray. The fan which keeps up the circulation has a diameter of 4 feet, and is large enough to keep up the circulation of air in two such evaporators. The evaporator is about 5 feet higher at the upper than the lower end, and the trays are put in at the top end and are easily slid down as those at the lower end are taken out.

A photograph of this evaporator will appear at some future time.

Seedling Peach.—Mr. E. H. Pickard, of Thirlmere, has raised a well-flavoured seedling peach, which has been named "Parnard." It is a freestone, rather small in size, ripens early in February, and crops well in that locality. A sample was forwarded to this Department, and those who tasted it pronounced it good. I was in the country, and, consequently, did not see it.

Choosing varieties of fruits to plant.—Ascertain the varieties of fruits which find most favour in the markets, then select such kinds as will thrive best in your soil and climate. After planting, work, manure, and prune these in the most up-to-date manner, and when they come into bearing, grade the fruit carefully; pack it neatly—in a word, do every part of the work thoroughly and you will not be disappointed when you make your yearly balance.

Practical Vegetable and Flower Growing.

W. S. CAMPBELL.

Directions for the Month of May.

Vegetables.

Cool weather is now setting in all over the State, and, except in very few localities, the summer, or tender, vegetables, or most of them, are at rest or have died away. The Jerusalem artichoke, one of the resting vegetables, should be ripe and quite ready for digging; but it may be safest merely to dig only the tubers that are required day by day, instead of raising the lot and chance their keeping. They do not keep very well above ground, even though much care may be taken in lifting them: and unless the ground in which they have been growing is required for other vegetables they may be left undug. Another resting vegetable is the onion; but all that are ripe should be lifted and kept in an airy shed with plenty of ventilation. Onions, if of a sound-keeping quality, should remain good for months if tied up in "strings" and hung up out of the way. When lifting onions take care not to bruise them nor let them dry in the sun, for if they are sun-dried they are not likely to keep good for any great length of time.

Asparagus.—The best time to plant is early in the spring, but the ground where it is to be planted should be made ready for it in good time. Trench it 2 feet deep, keeping the surface soil on the top. When trenching be exceedingly careful to keep the bottom of the trench even, or else water is liable to lodge in holes and hollows made by careless work. If the soil be not of good quality mix in a good dressing of manure when trenching. There is no urgency for planting, as this may be done at any time before the shoots or buds begin to grow in the spring.

Beans, Broad.—Sow largely from time to time, in order to keep up a supply. Sow in rows, according to height of variety—from dwarf, about 1 foot apart, to tall, about 4 feet apart. The bean prefers heavy soil, and succeeds best in it, although good crops may be obtained from any fair kind of soil.

Bean, French or Kidney.—Seed to a limited extent may be sown in the warmest districts of the State, but it is useless sowing where frosts are likely to occur.

Beet, Red and Silver.—Thin out young plants which are coming up from late sowings. It is not worth while sowing any seed during the month.

Borecole, or Kale.—Sow a pinch or two of seed for a trial.

Brussels Sprouts.—This is one of the best of vegetables, and should be grown extensively wherever it will do well. Sow a little seed in a seed-bed, and when the plants are large enough set them out about 2 feet or so apart, in good, rich soil.

Cabbage.—Sow seed now and then during the month, in order to keep up a supply of young cabbages for planting out when required. Sow but a few seeds at a time, for it is a great mistake to have on hand a large stock of old, weedy plants. Plant out any good, young cabbages in rich soil.

Cauliflower.—Sow a little seed and plant from seed-bed good, strong, young cauliflowers.

Carrot.—Sow seed from time to time as largely as you consider necessary, for this is a good time to sow the carrot. Early Shorthorn and Intermediate are good kinds for sowing this month.

Celery.—If any plants are available set out a few in well-manured ground.

Endive.—Sow a little seed and plant out from previous sowing. This will succeed where lettuce would grow with difficulty, and is a good substitute.

Leek.—Seed may be sown largely, and any suitable young leeks on hand may be planted. The soil should be made rich and the leeks kept sufficiently moist as they grow. They will need a good deal of water should the weather prove to be dry after planting.

Lettuce.—Sow seed largely during the month, and plant out sufficient young lettuces to keep up a good supply.

Onion.—Seed of this important and useful vegetable may be sown largely during the month. Use plenty of manure, mix it well with the soil, and make the surface of the onion-bed as fine as you can. Sow in drills about 1 foot apart unless small onions are required, when seed may be sown thickly. Obtain the best seed procurable, although a high price may have to be paid for it.

Parsley.—Sow a little seed.

Parsnip.—This vegetable requires the ground to be dug to a considerable depth. Sow a little seed from time to time.

Peas.—Sow abundantly from time to time, and keep a good supply going. Stake or stick the peas before they attain a large growth. Keep the soil well worked between the rows. Lime will be found most beneficial to apply to the soil for this vegetable. Sulphate of lime or gypsum is also most useful, and will be found to improve the flavour of the peas.

Radish.—Sow seed from time to time. Use a good deal of very well-rotted manure, and encourage the radishes to grow as quickly as possible; they will then be of good flavour and very tender.

Spinach.—Sow a little seed from time to time during the month in drills, about 18 inches apart.

Shallots.—Plant out some bulbs about 1 foot apart.

Herbs.—Sow a little seed.

Flowers.

Spring flowering bulbs should be planted as soon as possible, or else it will be too late for them if allowed to remain after this month.

Daffodils can be obtained now from Sydney seedsmen and from agents of seedsmen in the country at very cheap rates. These bulbs, having been acclimatised and raised in the State, should do well in gardens throughout the city.

The autumn planting of evergreens should have been completed before this. Attend to recently-planted trees and shrubs. Protect them from strong winds, so that they shall not suffer from being blown about.

Sow seeds of all kinds of hardy annuals and perennials, and transplant seedlings which are large enough.

Dahlias and chrysanthemums will soon be out of flower. Let the dahlias die down, but the chrysanthemum stems may be cut away as soon as all the flowers fade. Let all suckers grow, and in August cuttings can be taken for new plants.

Farm Notes.

HAWKESBURY DISTRICT—MAY, 1907.

H. W. POTTS.

THE few showers of rain which fell last month enabled farming operations to be prosecuted with vigour despite the fact that the subsoils are still dry. Sowing, however, has been carried on in the hope that the autumn rains may be sufficient to ensure germination and subsequent growth. The conditions for cultivation were so dry that towards the end of the month drilling, rolling, and harrowing were conducted in clouds of fine dust. The outlook is far from promising, though useful rain has since fallen.

The display of fruit and farm produce from this district at the Easter show of the Royal Agricultural Society was not up to the usual standard of excellence, nor were the exhibits as numerous. The season was phenomenally bad; the maize and potato crops failed, and with the exception of the horse stock, the evidence of our usual prosperity was absent.

Wheat.—On the principle that seed will keep as well in dry soil as in bags much has been sown, and rightly so. We can only hope for adequate rains. It is good farm practice to continue sowings of wheat. If required for grain purposes, the rust-resistant varieties may be used, such as Bobs, Jonathan, Nut Cut, and Comeback. For hay use Blount's Lambrigg, Allora Spring, White Lammas, Nonpareil, and Australian Talavera.

The Macaroni wheats may also be sown both for hay, green fodder, and grain. The sorts best suited to the district are Beloturka, Medeah, Farrer's Durum and Algerian.

In view of the prospective dry winter the Macaroni wheats will be best suited to stand dry conditions.

Oats.—The main crop may now be sown. Algerian and Argentine are varieties which in the past have afforded the highest yields for hay without being much affected with rust. Special care should be observed to use only plump graded seed and of good germinating power. Tartarian and Dun oats may be sown in small quantities.

Barley.—Further sowings of Cape barley may be made, particularly with the view of securing green fodder for dairy cattle in spring Where tares can be sown with them it would be a distinct advantage from a feeding standpoint, seeing this increases the protein portion of the ration and enhances its value in the production of milk.

Rye.—Now that the main cereal crops are in, and, of course, the best land utilised for the purpose, advantage may be taken of the slackened period to turn some attention to occupying the poorer lands with such a hardy and

useful crop as can be obtained from rye. One advantage of rye is its perennial nature. Rye stubble when permitted to stand some time will sprout again.

Owing to the plant throwing out four in place of three temporary shoots may be attributed its known hardy characteristics. Of course the grain is not so rich as that of wheat or barley. The protein contents are much less.

Rye will not only thrive well on soils wholly unsuited for other cereals, but it also is able better to resist the cold of harsh winters. The grain of rye is particularly suitable for pigs and may also be used for other domestic animals, and at times, when prices suggest it, in place of maize. The straw on account of its toughness is suitable for bedding for stock.

A good yield may be estimated at from 20 to 25 bushels per acre of grain. As a green fodder, this crop is especially acceptable to cows for maintaining a flow of milk. It is available, however, for only a short time, as it can be used only from just before heading until it is in full bloom.

On account of its known hardiness and powers to thrive well on poor, sandy loams, rye provides an excellent crop to grow as a green manure for ploughing in to increase the organic matter or humus in the soil. It has also been used on poor lands in this form in a rotation with wheat, grass, maize, and potatoes. The varieties which have given good yields in the past here are Imperial, Emerald, and Thousand-fold. The seed-bed may be prepared as for wheat. From 2 to 2½ bushels of seed may be sown per acre. Where it is required for green fodder, a larger quantity may be used. In some cases it has been found a good plan to graze off the young growth with sheep, then allow the paddock to rest, and a good yield of grain will follow.

There are large areas on the uplands along the Hawkesbury Valley which would respond in a prolific way to cultivation for rye.

Turnips and Swedes.—The last of the sowings may be made in the early part of the month, provided the weather conditions are sufficiently encouraging. With a good winter, these crops pay well.

Rape.—Further sowings of this excellent crop may be made, particularly where sheep are available to graze off the crops, to be followed by maize.

Sweet Potatoes.—The past season in the Hawkesbury district has been such as to fully demonstrate the value of this edible tuber, and its wonderful power to resist drought. It thrives on loose, sandy soils, and under conditions which would be fatal to the growth of other root crops, such as potatoes, turnips, carrots, beets, &c. As a vegetable it is little known in New South Wales, but fully recognised in the warmer climate of Queensland. In the past we have found certain varieties give very high yields, viz.: White Maltese, Pink, Big Stem Jersey Yellow, Short Stem Jersey Yellow, Pierson, and Jersey Red. The returns range from 10 to 28 tons to the acre. The crops this season are not so heavy, but to those who are fortunate to have a crop this will prove a stand-by for the table, as well as for domestic stock.

The tubers may be dug now and if properly stored will keep for months. The aim is to dig when the tubers are ripe, and to determine this it is necessary to test them at intervals until the correct stage is reached.

To ascertain the condition of ripeness cut a tuber or two. If unripe the juice flowing from the cut surface becomes dark and red in colour ; when ripe the surface dries white. Should the colour be red, then allow the crop to stay a few more days until ripeness is assured.

It is best to have the crop ready to dig before frosts set in and kill the vines. Dig if possible in dry weather. Should the moist conditions prevail, the tubers might be allowed to dry on a floor under cover with good ventilation. When thoroughly dry, then lay out on an earthen floor, protected from rain, and cover the tubers with dry earth or sand, preferably the latter, to the extent of 3 or 4 inches. As a vegetable the sweet potato can be cooked in a variety of ways and affords a relishable and highly-nutritious article of diet. Approximately this esculent tuber contains 60 per cent. starch and 14 per cent. sugar, and consequently is eminently suitable as a fodder for domestic stock, especially pigs.

Lucerne and Clovers.—The last mowings of the season can be made in the early part of the month of these highly-nutritious fodders.

Onions.—The late crops may be sown and will do well, provided we get rain in sufficient quantity. Once the plant is established it is surprising how the plant will resist dry conditions. The rows penetrate to a great depth in search of moisture. It is essential to have the beds cultivated to a good depth and the surface brought into a fine state.

Field Peas and Beans.—These crops may be sown, and, although not usually on the high side from a field point of view, yet they are amongst the best of the legumes for the purposes of ploughing in as a green crop to restore impoverished soils and prepare the ground for the spring sowings of maize.

Carrots and Parsnips.—Small sowings of these root crops may be made for feeding stock as well as table use.

Jerusalem Artichokes.—These will require to be dug, dried carefully, and stored in dry sand under cover.

Shade and Shelter Trees, Shrubs, and Hedges.

The autumn is the best season to plant these useful and decorative adjuncts to farming. As the native timbers are being steadily removed it is becoming a necessity to make provision for suitable belts of timber for stock, to afford them shade in summer and shelter in winter.

These are easily raised from seed and occupy little time to keep them growing. Such trees as the Red and White Cedars, Peppers, Pinus insignis, Pinus maritima, Pinus longifolia, Silky oaks, Kurrajongs, Plane trees, Sugar-gums, Catalpas, and Camphor laurels all grow well and quickly. Amongst the useful hedges may be mentioned the broad and narrow leaved Japanese privets, African box thorn, Kaffir apple, and Honey locust.

Crown Lands of New South Wales.

The following areas will be available for selection on and after the dates mentioned :—

Conditional Purchase as Special Area.

Grafton Land District, within Lawrence Population Area, 193 acres, maximum area 193 acres, minimum area 193 acres, being portion 41, parish of Lawrence, county of Clarence; undulating open forest country, fairly well grassed, timbered with spotted gum, oak, tea-tree, ironbark, and mahogany; price, £1 5s. per acre. Available for original applications only on the 9th May, 1907.

Parkes Land District, within Parkes Population Area, 206½ acres, maximum area 110 acres, minimum area 96½ acres, being portions 163 and 164, parish of Kamandra, county of Ashburnham; residential areas, suitable for agriculture and grazing; price, £2 per acre. Available for original applications only on 30th May, 1907.

For Conditional Purchase Lease.—(Available under Section 10 of Act of 1905. Regulations 356 to 365. Applications to be made on Form No. 114).

C.P.L. No.	Name of Land District	Holding.	Total Area.	No. of Blocks	Area of Blocks.	Distance in Miles from nearest Railway Station or Town.	Annual Rental per Block.	Date available.
			a. r. p.		a. r. p.		£ s. d.	1907.
67	Condobolin.	Borambil	.	1	700 0 0	Condobolin town and railway station 3½ miles	23 6 8	23 May.

Almost level country, about 70 acres rather swampy in wet seasons; black and red clayey soils; about 35 acres of thick box sapling forest; about 460 acres open box forest, about 50 acres of which has been ringbarked, some suckers and seedlings, about 205 acres open plain; about 530 acres suitable for agriculture, balance suitable for grazing or dairying. All liable to inundation during big floods. Water in Goobang Creek, to which the portion has frontage, is almost permanent. Good sites for tanks exist, and water can be obtained by wells at a depth of about 50 feet. Average rainfall, 17¼ inches per annum.

70	Corowa . .	.	4,127 1 0	11	323 3 0 to 430 2 0	Corowa, from 19 to 25 miles; Balldale railway station, 12 to 14 miles.	24 5 8 to 34 19 6	16 May.

Generally level unbroken country, partly undulating, and a small area low lying and swampy; partly of granite formation, with a little gravel, quartz, and slate showing in places; mostly good red loam soil, some gravelly soil, clay subsoil, with a little rock in places; mostly thick forest country, timbered with box, oak and pine; parts, fairly open forest country, timbered with box, oak, pine, and a little gum; nearly the whole area is good agricultural land; sound breeding and fattening country. Rainfall, 21 inches per annum. No natural water supply, but there are good facilities for conservation; also small tank on one block.

69	Dubbo	Barbigal ..	3,447 3 10	3	861 3 0 to 1,554 3 10	Dubbo, 11 to 13 miles	10 14 10 to 25 18 4	16 May.

Undulating and partly hilly country; sedimentary formation, sandy gravelly and stony in places; red sandy soil, and subsoil of sand, clay, gravel, and stone; mostly the whole area comprises thick forest of box, pine, oak, ironbark, and gum, in all stages of growth; about 860 acres of agricultural land. No natural water supply, but there are fair facilities for storage. Water in Jones' Creek is not permanent or sufficient.

68	Port Macquarie.	....	1,238 1 0	9	95 1 0 to 179 2 0	Laurieton, 28 miles	3 11 6 to 6 6 6	16 May.

Land suitable for breeding or dairying, a small area suitable for agriculture; sandstone ridges, and partly hilly, with reddish clayey soil, with clay subsoil, and partly undulating country of good soil, covered with heavy brush; a little timber suitable for fencing, &c. Water supply plentiful.

FOR ORIGINAL SETTLEMENT LEASE ONLY.—(Available under Section 25 of Act of 1895. Regulations 148 to 157D. Applications to be made on Form No. 50).

S.L. No.	Name of Land District.	Holding, &c.	Total Area.	No. of Farms.	Area of Farms.	Distance in Miles from nearest Railway Station or Town.	Annual Rental per Block.	Date available.
			acres.		acres.		£ s. d.	1907.
856	Bingara ..	Rocky Creek	33,665 (about)	12	2,050 to 4,510	Narrabri town and railway station, 32 to 50 miles.	12 18 4 to 29 18 0	6 June

Generally mountainous and undulating country, with some rough, broken ridges; diorite, granite, sandstone, limestone, and basalt formation; soil chiefly hard greyish, sandy and gravelly in places; parts light greyish, stony, and gravelly, greyish, whitish, and reddish, with gravel subsoil; timbered with box, gum, and stringybark, with patches of narrow-leaf ironbark, and a little yellow-jacket and apple; some pine scrub; pasturage poor, but can be improved by judicious ring-barking; sound country, suitable for cattle-grazing and breeding; small patches may be found suitable for cultivation for home use. Rabbits exist on the land. Rainfall about 30 inches per annum. Water permanent in parts of Rocky Creek, and in Back Creek and Hill Hole Creek in ordinary seasons, when it can also be obtained by sinking along these creeks, and on T.S.R. 38,255.

FOR ORIGINAL HOMESTEAD SELECTION ONLY.—(Available under Section 14 of Act of 1895. Regulations 49 to 58A. Applications to be made on Form No. 7).

H.S. No.	Name of Land District.	Total Area.	No. of Blocks.	Area of Blocks.	Distance in Miles from nearest Railway Station or Town.	Annual Rental per Block.	Date available.
				acres.		£ s. d.	1907.
1,012	Dubbo ...		1	320	Narromine railway station, 2¾ miles.	12 0 0	16 May

Level country; sedimentary formation; 220 acres red loam, with clay subsoil, suited for cultivation; 100 acres black soil, grazing land; 120 acres open box and pine forest. Average rainfall, about 21½ inches. No natural water supply. Good facilities for conservation.

1,013	Dubbo ..		1	227½	Dubbo, 10 miles ...	3 11 2	16 May

Hilly and undulating country, broken with gullies in places; sedimentary formation; red volcanic and red sandy soil; subsoil of clay and stone; 127 acres of fairly open forest, and 100 acres of thick forest of pine, ironbark, and carraway, about 80 acres of agricultural land, in three parts. Water in Talbragar River.

FOR ORIGINAL CONDITIONAL PURCHASE ONLY.—(Classified under Subsection 1 (A), Section 4, of Crown Lands Amendment Act, 1905.) Available under Section 26 of Act of 1884. Regulations 74 to 130. Application and declaration to be made on Forms 21 and 22.

Name of Land District.	Name of Holding, &c.	Parish.	County.	Total Area.	Price per Acre.	Date available.
				a. r. p.	£ s. d.	1907.
Goulburn .	....	Cookbundoon .	Argyle .	40 0 0	0 8 4	16 May

Suitable for grazing.

Grafton* .	Lawrence Population area.	Lawrence .. .	Clarence ..	193 0 0	1 5 0	9 May

Being portion 41; undulating open forest country; fairly well grassed, timbered with spotted gum, oak, ti-tree, ironbark, and mahogany.

Muswellbrook .	....	Brogheda	Brisbane	75 0 0	2 5 0	20 June

On Wybong Creek, being portion 173; suitable for agriculture, dairying, &c.

Parkes*	Parkes Population area.	Kamandra	Ashburnham	206 1 0	2 0 0	30 May

Being portions 163 and 164; residential areas, suitable for agriculture and grazing.

* Identical with Special Area, see page 496.

For Original Conditional Purchase and Conditional Lease in virtue thereof.—(Classified under Subsection 1 (b), Section 4, of Crown Lands Amendment Act of 1905); available under Sections 26 and 48 of Act of 1884. Regulations 74 to 130. Application and declaration for Original Conditional Purchase to be made on Forms 21 and 22, and for Conditional Lease on Forms 95 and 96.

Name of Land District.	Name of Holding, &c.	Parish.	County.	Total Area.	Price per Acre.	Date available.
				a. r. p.	£ s. d.	1907.
Bathurst	....	Yetholme	Roxburgh	1,890 0 0	0 8 4	9 May
Bathurst	....	Walberton	Roxburgh	3,260 0 0 and 2,000 0 0	0 10 0 and 0 13 4	6 June
On Four-mile and New Chum Creeks; suitable for grazing.						
Bathurst	....	Ulmarrah	Wellington	930 0 0	0 16 8	6 June
On Pyramul Creek; suitable for grazing.						
Bellingen	....	South Bellingen	Raleigh	90 0 0	1 0 0	6 June
Suitable for grazing.						
Carcoar	.....	Jeremy and Burraga	Georgiana	2,100 0 0	0 11 8	6 June
On Thompsons Creek; suitable for grazing						
Casino	....	Jiggi	Rous	2,500 0 0	0 15 0	30 May
On Hanging Rock and Borabee Creeks; suitable for grazing						
Cooma	...	Nungar	Wallace	320 0 0 and 370 0 0	1 0 0	6 June
On Eucumbene River; suitable for grazing.						
Coonabarrabran.	.....	Greenbah and Cuttabulloo.	Gowen	2,720 0 0	1 0 0	9 May
Cootamundra	.....	Ulandra	Clarendon	83 1 0	1 0 0	30 May
Being portions 43 and 72; suitable for grazing.						
Glen Innes	...	Mount Mitchell	Gough	600 0 0	0 16 8	13 June
Goulburn	.	Leighwood	Georgiana	1,400 0 0	0 10 0	9 May
Grafton	.....	Pulganbar	Drake	297 0 0	1 10 0	6 June
Suitable for grazing, dairying, &c.						
Gundagai	.	Childowla	Buccleuch	470 0 0	0 15 0	13 June
Good grazing land when improved.						
Gundagai	......	Childowla	Buccleuch	820 0 0	0 13 4	13 June
Good grazing land when improved.						
Moruya	.....	Tomaga	St. Vincent	640 0 0	0 11 8	30 May
On Mogo Creek; suitable for grazing.						
Mudgee	....	Terraban	Bligh	700 0 0	1 10 0	30 May
Suitable for grazing and agriculture.						
Mudgee	....	Warratra and Toomanang.	Wellington	1,280 0 0 1,280 0 0 and 900 0 0	0 13 4 0 16 8 and 1 0 0	6 June
On Campbell's Creek; suitable for grazing.						
Mudgee	....	Collieblue	Bligh	540 0 0 1,550 0 0 and 57 0 12	0 15 0 1 10 0 and 3 0 0	13 June
Mostly good grazing land.						
Newcastle	....	Sutton	Gloucester	522 2 0	0 10 0	9 May
Suitable for grazing, dairying, and poultry farming.						
Nowra	....	Wallaya	Camden	199* 1 0	0 11 8	13 June
Suitable for grazing.						
Rylstone	....	Coolcalwin	Phillip	370 0 0	1 5 0	30 May
On Cudgegong River; suitable for grazing and agriculture.						
Stroud	....	Nerong	Gloucester	3,435 0 0 3,400 0 0 and 420 0 0	0 10 0 0 10 0 and 0 15 0	13 June
Suitable for grazing and dairying.						

FOR ORIGINAL CONDITIONAL PURCHASE AND CONDITIONAL LEASE IN VIRTUE THEREOF—*continued.*

Name of Land District.	Name of Holding, &c.	Parish.	County.	Total Area.	Price per Acre.	Date available.
				a. r. p.	£ s. d.	1907.
Tenterfield ..	....	Colongon	Buller .	485 0 0	0 16 8	13 June
Suitable for grazing and dairying.						
Wellington	.. ..	Yarrobil and Puggoon.	Bligh .	3,600 0 0	1 2 6	6 June
Suitable for grazing and agriculture.						
Windsor.. .	. . ...	Wonga ..	Hunter .	146 0 0	1 0 0	13 June
Suitable mainly for grazing.						
Wyalong ..	....	Wyalong . ..	Gipps ..	380 0 0 and 13,880 0 0	0 6 8 and 0 8 4	13 June

CONDITIONAL PURCHASE (ORIGINAL OR ADDITIONAL) OR CONDITIONAL LEASE.—(Available by revocation of reserves, and not classified or specially set apart under Section 4 of the Crown Lands Amendment Act of 1905.) Available under Sections 26, 42, and 48 of Act of 1884. Regulations 74 to 130. Application and declaration for Original Conditional Purchase to be made on Forms 21 and 22, and for Additional Conditional Purchase or Conditional Lease on Forms 95 and 96.

Name of Land District.	Name of Holding, &c.	Parish.	County.	Total Area.	Price per Acre.	Date available.
				a. r. p	£ s. d.	1907.
Braidwood .	.. ..	Bundawang	St. Vincent.	180 0 0	1 0 0	6 June
On Mongarlowe River. Available by revocation of part of Mongarlowe and Shoalhaven River gold-field reserve.						
Braidwood .	....	Bundawang and Mongarlowe.	St. Vincent	670 0 0	1 0 0	13 June
Braidwood .	....	Meangora ..	St. Vincent .	132 0 0	1 0 0	13 June
Lismore .	....	Jiggi . ..	Rous .	675 2 0	1 0 0	30 May
Being portions 123 to 125.						
Moruya ..	....	Noorooma . ..	Dampier ..	194 0 0 380 0 0 and 3,700 0 0	1 0 0	30 May
Moss Vale	. .. ..	Bullio .. .	Camden .	55 0 0	1 0 0	13 June

FOR IMPROVEMENT LEASE—(Available under Section 26 of Act of 1895. Tender to be made on Form 74. Regulations 157E to 160 and 250 to 262A. If not bid for at auction, or tendered for within time advertised, may be subsequently applied for on Form 91).

Block Numbers.	Land District or Place of Sale.	Name of Holding.	Total Area.	No. of Blocks.	Area of Blocks.	Upset Annual Rental per Block.	Date of Sale or Tender.
EASTERN AND CENTRAL DIVISIONS.							
			acres.		acres.	£ s. d.	
646 and 1,443	Barmedman	Temora and Mandamah	1,960	2	1,715 and 245	3 11 6 and 0 10 3 (inclusive of rent for Crown improvements.)	Sale, 14th May, 1907.

Chiefly undulating and level country, small area ridgy; soil varying from red clay loam to sandy, gravelly in places; thickly timbered with box, with some ironbark, pine, currawang, wattle, &c., with scrub of sifting-bush, box, pine, and ironbark seedlings. No natural water supply; fair facilities for conservation exist Very few rabbits in locality, and no other pests of any consequence. Rainfall averages about 18½ inches per annum. About 10 miles from Barmedman, and 7 to 9 miles from Reefton Railway Station.

FOR IMPROVEMENT LEASE—*continued.*

Block Numbers.	Land District or Place of Sale.	Name of Holding.	Total Area.	No. of Blocks.	Area of Blocks.	Upset Annual Rental per Block.	Date of Sale or Tender.
					EASTERN DIVISION.		
656	Braidwood	....	......	1	a. r. p. 463 0 37	£ s. d. 11 11 8	Sale, 14th May, 1907.

The country consists of low ridges of granite formation, loose gritty soil, not suitable for agriculture, but fair grazing when cleared; gum, peppermint, stringybark, and a little honeysuckle, with a little scrub of those timbers. There is permanent water in Durran Durra Creek. Situated 2 or 3 miles from the village of Larbert, and about 20 miles from Bungendore and Tarago Railway Stations.

Block Numbers.	Land District or Place of Sale.	Name of Holding.	Total Area.	No. of Blocks.	Area of Blocks.	Upset Annual Rental per Block.	Date of Sale or Tender.
653 and 654	Goulburn..............	....	4,946	2	acres. 3,800 and 1,146	15 16 8 and 4 15 6	Sale, 13th May, 1907.

For the most part extremely poor, of slate formation; extremely rough; part loose slate shingle; timber—white and ribbon gum, peppermint, stringybark, and mountain ash; none suitable for cultivation; will run about one sheep to 10 acres unimproved. Situation—about 15 to 20 miles from Goulburn.

CENTRAL DIVISION.

Block Numbers.	Land District or Place of Sale.	Name of Holding.	Total Area.	No. of Blocks.	Area of Blocks.	Upset Annual Rental per Block.	Date of Sale or Tender.
1,456	Condobolin........ ...	Euglo and Moonbi or Bogandillon.	. ..	1	7,820	46 16 0 (inclusive of rent for Crown improvements.)	Sale, 14th May, 1907.

Almost level country, with a low stony ridge on east boundary, and two small gravelly patches near centre of block; the soil, except for above-mentioned gravelly patches and about 1,000 acres of stiff clay along the west boundary, is good red sandy loam, the timber consists of thick pine forest, with some box, yarran, boree, budda, and belar, with thick pine scrub and young yarran, belar, box, and budtha, camomile, gooma, sifting-bush, and warrior-bush. Average annual rainfall, about 18 inches. No natural water supply; two good tanks of 3,200 and 1,800 cubic yards respectively are included, affording a sufficient supply. About 32 miles from Condobolin Railway Station.

Block Numbers.	Land District or Place of Sale.	Name of Holding.	Total Area.	No. of Blocks.	Area of Blocks.	Upset Annual Rental per Block.	Date of Sale or Tender.
1,449 1,450 1,451 and 1,452	Coonamble	Yalcogrin	6,260	4	410 to 2,875	5 2 6 to 35 18 9	Sale, 13th May 1907.

Flat level land; almost the whole area is densely timbered with pine, box, oak, yarran, budtha, and some ironbark, gum, apple, and box on river frontage; parts open box, budtha, and plain; chiefly red sandy loam; temporary water supply in Castlereagh River, Terrabile and Ulomogo Creeks, but permanent a few feet under the sand in the bed of the Castlereagh River; good facilities for conservation. Situation—blocks 1,449 and 1,450 adjoin the village of Terrabile, 2 to 5 miles from Terrabile or Curban Railway Station.

Block Numbers.	Land District or Place of Sale.	Name of Holding.	Total Area.	No. of Blocks.	Area of Blocks.	Upset Annual Rental per Block.	Date of Sale or Tender.
1,071 and 1,446	Nyngan	West Bogan	17,940	2	8,970 each	18 13 9 each	Sale, 14th May, 1907.

ed sandy loam, with gravelly ridges, level, and undulating; timber—box, pine, coolibah, budtha, yarran, wilga, ironwood, white-wood, needle-wood, and currawong, with patches of mallee, dense pine, hopbush, budtha, and other scrubs. No water supply; fair facilities for conservation. Rainfall, about 20½ inches per annum. Rabbits are fairly numerous. About 12 miles north-westerly from Nyngan.

Block Numbers.	Land District or Place of Sale.	Name of Holding.	Total Area.	No. of Blocks.	Area of Blocks.	Upset Annual Rental per Block.	Date of Sale or Tender.
1,297 1,299 and 1,301	Nyngan	Canonbar	22,051	3	5,519 to 8,866	23 0 0 to 64 13 0	Sale, 14th May, 1907.

Red and dark soil, inclined to be sandy in places; timber—hopbush, wattle, pine, budtha, oak, belah, box seedlings, currant-bush, and wilga. Good temporary supplies of water in Bogan River; fair tank catches on back lands. Rainfall, about 20 inches per annum, and irregular. Situated within the limits of the Bogan River Weir Scheme. Native dogs, emus, rabbits, wallabies, kangaroos, and rats exist.
These blocks are situated from 15 to 20 miles southerly from town and railway station of Nyngan.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Sub-Editor not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1907.

Society.	Secretary.	Date.
Clarence P. and H. Society, Grafton	T. T. Bawden ...	May 1, 2
Dubbo P., A., and H. Association	F. Weston ...	,, 1, 2
Lower Clarence A. Society	G. Davis... ...	,, 7, 8
Coonamble P. and A. Association	J. M. Rees ...	,, 8, 9
Hawkesbury District Agricultural Association ...	C. S. Guest ...	,, 9, 10, 11
Molong P. and A. Association	C. J. V. Leathem	,, 15
Walgett P. and A. Association...	Thomas Clarke ...	,, 15, 16
Central Australian P. and A. Association (Bourke)...	G. W. Tull ...	,, 22, 23
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Condobolin P. and A. Association	W. Maitland ...	,, 30, 31
Forbes P., A., and H. Association	N. A. Read ...	Aug. 7, 8
Narrandera P. and A. Association	W. T. Lynch ...	,, 7, 8
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Wyalong District P., A., H., and I. Association ...	S. G. Isaacs ...	Oct. 1, 2

1908.

Society.	Secretary.	Date.
Albion Park A., H., and I. Society	H. G. Frazer ...	Jan. 15, 16

[5 Plates.]

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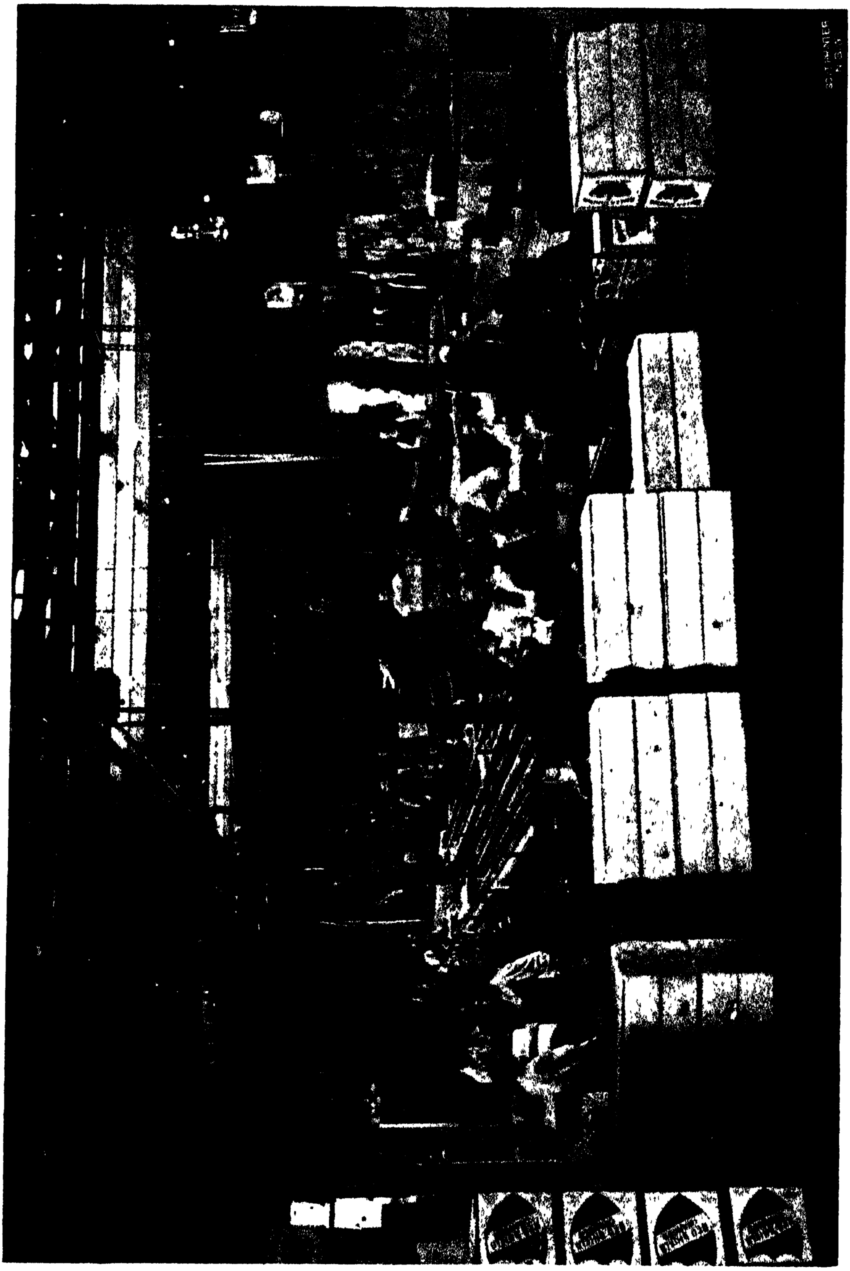


Interior of the Azusa Foothill Citrus Association's Packing-house, California.

Agricultural Gazette of New South Wales.

Curing the Lemon.

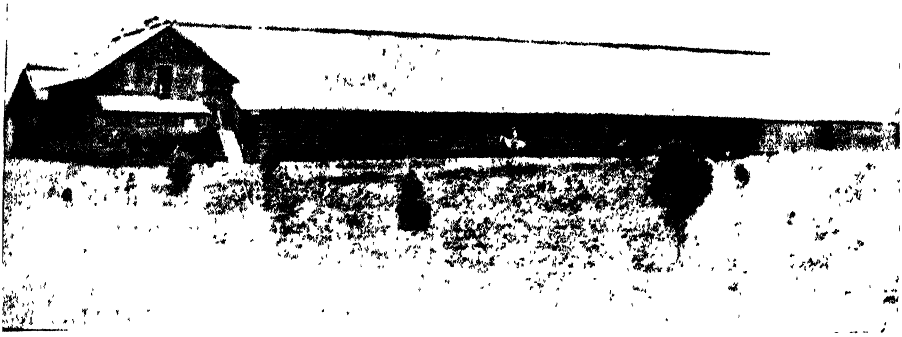
W. J. ALLEN.

WHILE there is no country where this fruit will thrive better than in Australia, and perhaps none where the lemon can be more easily cured than in the dryer parts, there has, on the other hand, been some difficulty found in curing them where they have been grown along the coast, where there is more humidity in the atmosphere, and where they do not require anything further than thorough cultivation to keep them growing and producing good crops annually. While we cannot change the climate (and perhaps would not if we could), the question arises: Is it possible to successfully cure lemons grown under the climatic conditions which prevail in our coastal districts? If it were possible it would be a great boon to our growers. If however it is impossible to store and keep the lemons for months on the coast, as can be done in the dry climate of our interior, they can at least be kept for a short time after picking—long enough, at any rate, to greatly improve the condition of the fruit, and no one can fail to notice the difference between a cured and an uncured lemon. The one has a nice fine skin, and is full of juice, whilst the other is hard and thick-skinned, from which it is difficult to extract the juice.

Our largest crop of lemons usually ripens during the coldest weather, when the demand for them is comparatively light, and those growers who market their fruit at that time of the year will often find that after the expenses of freight, boxes, and commission are deducted, there is very little left for the trouble of growing, picking, and marketing.

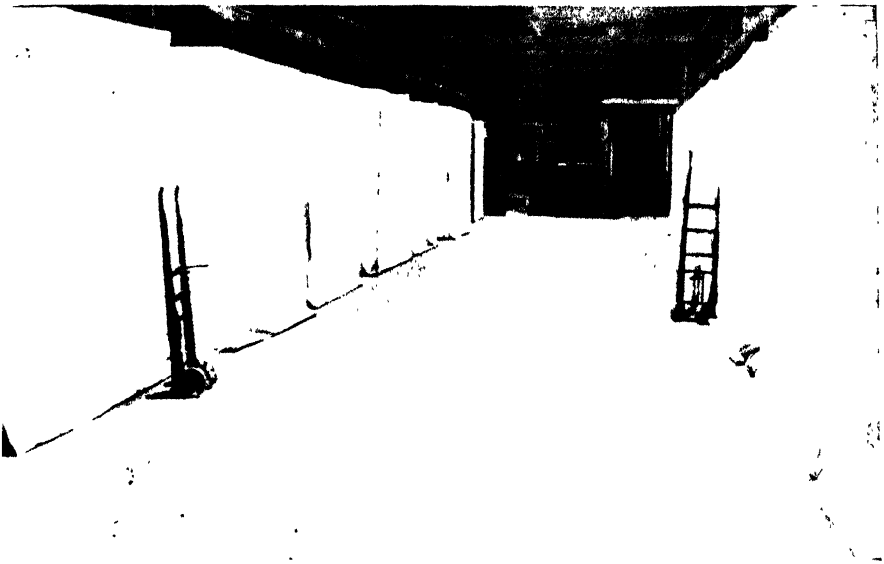
To begin with, the fruit must be picked carefully, and not handled like potatoes, but more after the manner of handling eggs, as decay is liable to set up in any bruised part. The method of procedure would be quite different in most cases to that now practised by a majority of growers, who simply pull the fruit from the tree in a very careless manner, and, in a still more careless fashion, roll or drop them into a basket or case, and these, in turn, are again dumped into another receptacle, perhaps a cart, without any regard as to whether they are bruised in the process or not. From the cart, the fruit is very often simply packed into cases, without any pretence at curing. During those years when lemons are scarce they frequently command good prices, even though handled in this way, but during normal seasons there is generally a month or two, when the bulk of the fruit is ripening, when the grower is not moved to exuberance over his returns. If then, by some means, he could even tide over such a season, by holding the bulk of his lemons until the markets assume a more favourable tone, it might make a material difference in his income. Therefore, why not make a start by picking a portion of the

crop before it becomes too ripe, during the months of May, June, and July, and store such fruit away in well ventilated, dry, cool buildings, either in boxes or trays, and see if by handling the fruit carefully it will not keep until there is more demand for it. It is always more easy to store small than large quantities, therefore the larger the quantity to be experimented with the more careful will the grower have to be about the building in which he keeps his fruit. A small closed room may be a capital place in which to keep a few lemons, but perhaps not at all suitable if the room was filled with the fruit. We neither want the lemon to sweat, nor do we want it to shrivel, and if we can strike the happy medium we are on the right track. It has been demonstrated, both here and in California, that lemons keep best when pulled



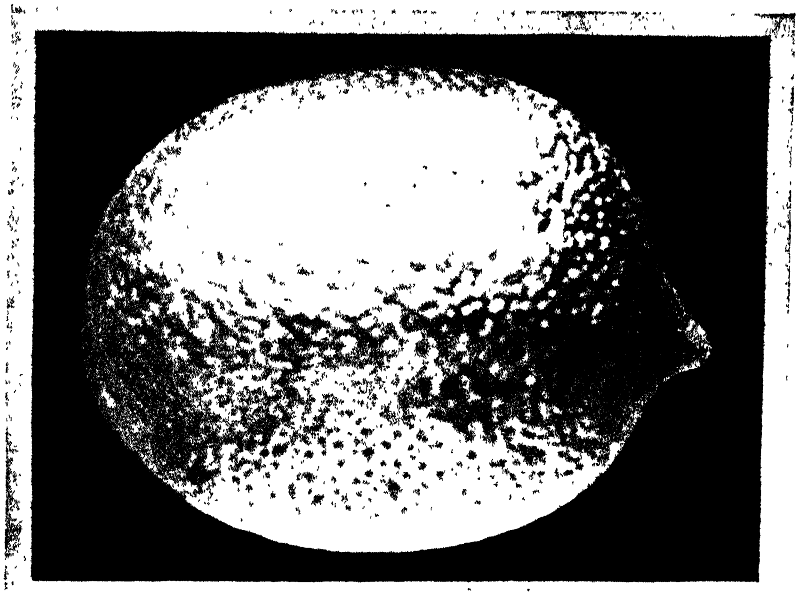
Californian Lemon-curing Shed and Packing-house

just as they are beginning to turn ripe, and that, on the contrary, they do not keep so well when allowed to hang until quite ripe. They are best picked as soon as they are about $2\frac{1}{2}$ inches in diameter. When they are over $2\frac{3}{4}$ inches they are over size, except for making lemon peel, when a good thick-skinned 3-inch lemon suits admirably, but we are now talking of lemons for curing. When they attain the proper size they should be picked even though they are almost green. They should be allowed to stand for a few days and then packed away in paper lined boxes, which may then be stacked in blocks in such a manner as to permit of a free circulation of air around each case. The packing house in use by Mr. Lippingwell, of Whittier, gives a fair idea of what a curing house looks like. The building is large and airy, being 250 feet long and 150 feet wide, and is about 3 feet clear of the ground.

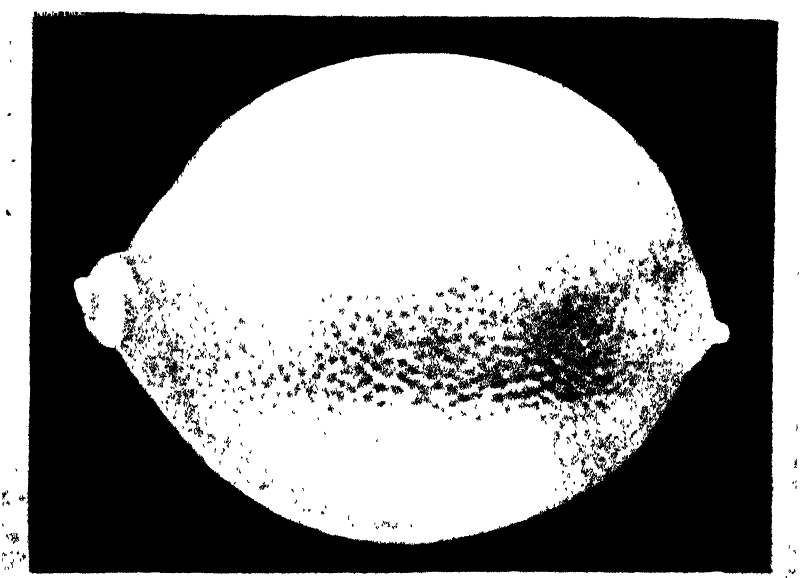


Interior of Shed, showing Curing-tents.

Interior of Shed, showing how the alley-way is made use of for packing.

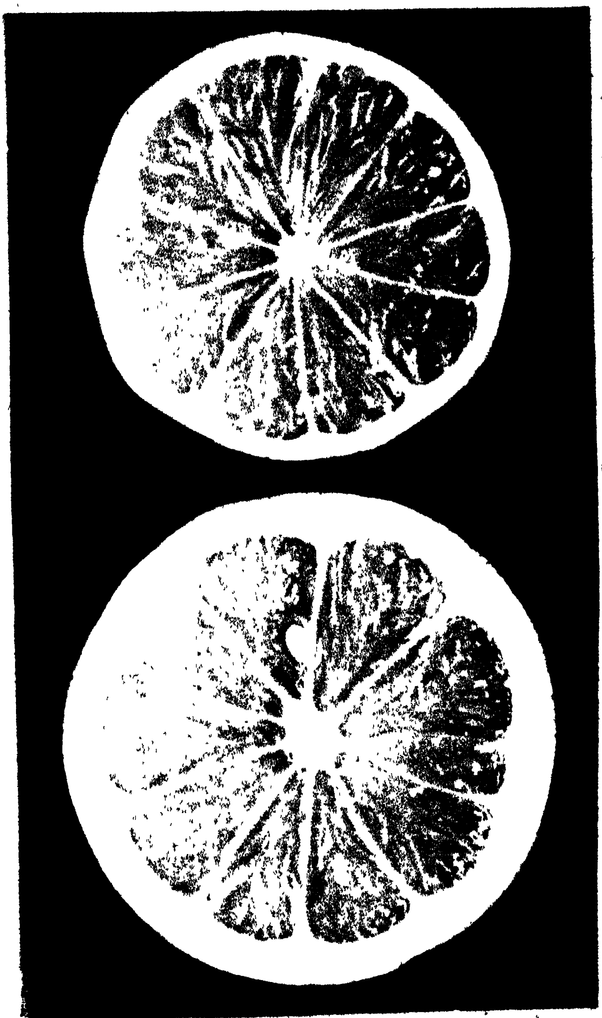


Uncured Lemon.



Cured Lemon.

This gives a good circulation of air beneath the floor, which is most important. There are no permanent partitions in the building; the stacks of cases are arranged in blocks of four, separated by a narrow space of about 2 feet; these blocks run in rows the length of the building, being separated by a passage



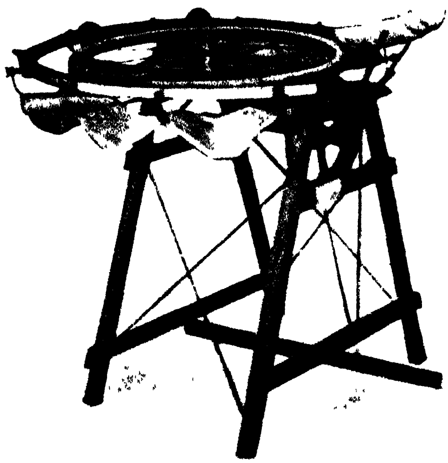
Cured Lemon.

Uncured Lemon.

about 4 feet wider running transversely. The rows thus formed are placed 12 feet apart; in this way a large passage or alley-way is left for packing, &c. While the 4-foot passage gives a ready means of passing from one alley-way to another the small spaces between the stacks of four are for the purpose of adjusting the tents and for ventilation.

In the illustration on page 505 the arrangement of the stacks is very clearly shown; the space near the truck on the left is 4 feet, then comes a stack, then a 2 feet space, and then a stack, and so on.

In California the blocks are so built that a canvas covering 10 feet x 10 feet x 20 feet made box shape, will cover them, the canvas being open at the four corners and the corners are so arranged that they may be laced quite tight, or may if necessary be loosened, and the sides of the box or tent raised so as to admit more air and allow any superfluous moisture to escape. After the fruit has been stored for a few weeks the sides of the tents seldom require raising if the curing shed is well ventilated. If it is found that they are keeping well they may be left under the covering for several months until they are thin skinned and pliable; but they should be marketed before the

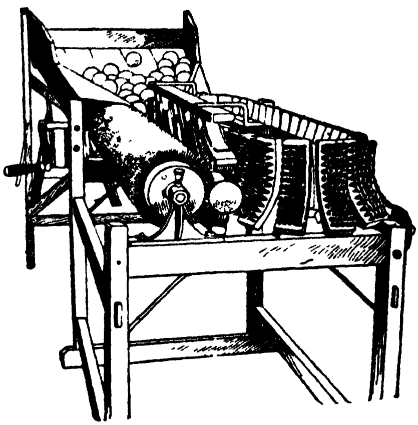


Single Grader.

skin begins to harden in the least. If any of the lemons are decaying in the cases the fruit may be sorted over every month or six weeks, and all fruits removed which show signs of decay or are out of condition.

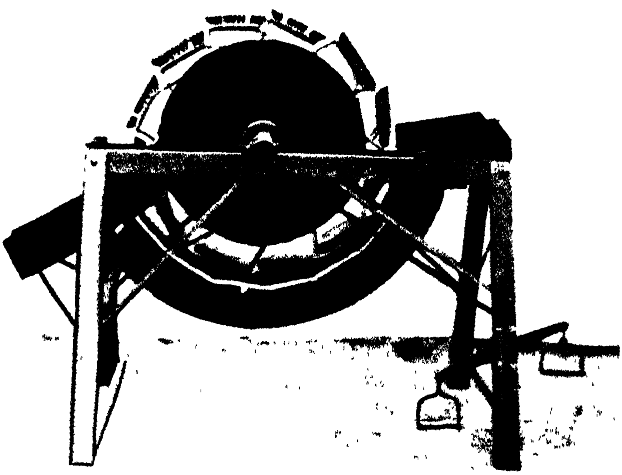
The method described is the best that has been practised up to the present, but I think that before many years even this will be improved upon. The object in curing lemons is to reduce the thickness of the peel and make it tough—to increase its juiciness and to hold it in good condition for a favourable market. In California all lemons are cured before being marketed, and the means adopted there of curing them quickly, is to pick the fruit, grade it according to colour, as it will take a green lemon longer to cure than a partially

coloured one, stack them away under the canvas tents as described above after they have been washed, and in doing so leave sufficient room at one end to allow of a kerosene stove with three large burners being placed inside the tent; over the lamp a galvanised iron tank about 3-feet in length by 18 inches wide which is partially filled with water is placed. In this way it is possible to keep the temperature at 90° F., and this heat is maintained for from one to two weeks or until the fruit is brought to that nice pale straw colour which is so desirable. It is then graded, packed and marketed. Such lemons, if of best quality, were bringing up to 26s. per case during my visit to California last September.



New Victor Fruit Brusher.

This method of curing lemons is being adopted by all up-to-date lemon-growers of that country, and in no instance did I hear it condemned. All large packing houses have large washing machines, plenty of room for storing



Tangent Fruit Brusher, No. 4.

fruit, and in most of them large graders. The washing machines and graders are run by electricity, as this form of power is very cheap over there. All

large growers, and a good many of the smaller ones, have the telephone connected with their dwelling and packing houses at a cost of about 6s. per month. The price of an up-to-date washer and grader combined is from £60 to £80, and for smaller washing machines about £10.

The washing and brushing machines, shown in the illustrations, are small hand machines; these are used in the smaller packing houses for removing dust and fumigine; they are not used to remove scale, but merely for cleaning and improving the appearance of the truit.

System of Pruning adopted in Lemon Orchards in California.

There is a modified form of co-operation amongst the citrus growers of California, about 50 per cent. of whom belong to an association having its head quarters at Los Angeles, with branches in every district where citrus fruits are being largely grown. This association has agents appointed in all the larger cities throughout the United States and Canada, who watch the interests of the growers and see that the fruit is properly marketed. Should the market be glutted when a consignment of fruit arrives, the latter is either sent on to some other city or held over in cold storage, if it is practicable, until there is a demand for the fruit.

Forestry.

Some Practical Notes on Forestry suitable for New South Wales.

[Continued from page 409.]

J. H. MAIDEN,
Government Botanist and Director of the Botanic Gardens, Sydney.

XVII—*continued.*

Conifers.

III.

CONIFERÆ.

Tribe—Cupressineæ.

Sub-tribe 1.—*Juniperinæ.*

1. Juniperus.

"The Junipers are evergreen, medium-sized, or low trees of pyramidal or fastigiate habit, but in old age often with rounded or flattened tops and irregular in outline: or bushy shrubs of spreading habit, occasionally quite prostrate. Their habit is greatly modified by climate and locality, and in mountainous regions by altitude and aspect, so that the same species which are arborescent in the warmer and more favoured districts are reduced to prostrate shrubs at their northern limit or highest vertical range. Instances of these extreme forms in habit occur in *Juniperus communis, J. excelsa, J. recurva, J. virginiana*, and others. The foliage is dimorphic, consisting either of pungent acicular or awl-shaped leaves in whorls of three, or of small scale-like leaves, closely imbricated or concrescent in decussate pairs. In some species, as *J. communis*, the acicular foliage is constant; in others, as *J. excelsa, J. virginiana*, it prevails up to ten, twelve, or more years, when it gradually gives place to the smaller scale-like leaves; in others again, as *J. chinensis*, both forms of leaves are present from a very early age; in the typical *J. Sabina*, at least in Great Britain, and in a few other species, the scale-like leaves only are present."—(Veitch's Manual.)

The genus may be divided into two well-marked sections—

a. Oxycedri. Leaves homomorphic, acicular or awl-shaped.

b. Sabinæ. Leaves dimorphic, acicular or scale-like.

(1.) *J. bermudiana*, L. "Bermuda Juniper"; "Pencil Cedar."

A monœcious tree, attaining a large size. A handsome species, doing well in our warmer coast districts.

Juniperus bermudiana, L.

Botanic Gardens, Sydney.

For figures, see Hooker in *Lond. Journ. Bot.*, ii, 141, t. 1, and Hemsley in *Gard. Chron.*, xix, p. 656 (1883).

Native of the Bermudas. Formerly much in demand for lead pencils, but now superseded by the more abundant *J. virginiana*. Apart from its beauty, it is most valuable, and its cultivation in New South Wales should be encouraged.

U 2 k, 3, L 7, 22, 30 d (Sydney Botanic Gardens).

(2.) *J. californica*, Carrière. "Californian Juniper." Sargent, t. 517.

A tree attaining 40 feet in height. Inhabits dry mountain slopes and plains in southern California (Sargent). Surely it will, therefore, flourish in many parts of New South Wales.

(3.) *J. chinensis*, L. "Chinese Juniper."

A diœcious tree, attaining a height of 60–70 feet in China and Japan where it is native. It also grows in the Himalayas.

It is a well known and beautiful species, which does well in many parts of this State, and very readily forms colour variations. For instance, we have the following in the Sydney Botanic Gardens :—

Variety *argentea*, L 15 ; variety *japonica-argentea*, L 11 a ; variety *aurea*, L 20 d ; variety *aureo-variegata*, L 23 a.

(4.) *J. communis*, L. "The Juniper."

Usually a shrub, but some forms attain tree size.

Var. *cracorica*. "An arborescent form, with spreading branches, and long, slender, somewhat distant, subpendulous branchlets, which are at first yellowish, and furnished with longer leaves than in the common Juniper." (Veitch's Manual.)

L 7 (Sydney Botanic Gardens).

Var. *fastigiata* (*J. hibernica*). "Swedish Juniper."

An erect low tree, 12–15 or more feet high, of slender columnar habit , the branches and their ramifications erect, rigid, and closely appressed to the principal stems and to each other ; the youngest branchlets short, and furnished with close-set leaves that are smaller and usually more brightly-coloured than in the common form. The variety cultivated in gardens under the name of *compressa* is a diminutive form of *fastigiata*.

(5.) *J. drupacea*, Labill. "Syrian Juniper."

A diœcious tree 25–30 feet high, trees of the two sexes differing somewhat in habit.

Veitch says that it has secured a place in many British gardens on account of its hardiness, the unique shade of green of its foliage, and the small space it requires. It appears to be a fact that all the trees in Britain are males.

Yields a pleasant edible fruit. See *Gard. Chron.*, 1854, 455 f.

L 11 a (Sydney Botanic Gardens).

Juniperus chinensis, L. *(alla variegata.)*
State Nursery, Campbelltown.

(6.) *J. excelsa*, Bieberstein. The "Greek or Tall Juniper."

A (usually) monœcious tree of variable dimensions. It has a very extensive geographical range, from the Greek Archipelago through Asia Minor, &c., to the Himalayas. Its vertical range is also very considerable, so that one form or other of it will flourish in many parts of New South Wales.

L 6, 23 b, 35 c (Sydney Botanic Gardens).

(7.) *J. flaccida*, Schlecht.

Figured by Sargent, t. 519.

A tree of 20–30 feet. "One of the most beautiful of Junipers."

Native of Mexico and south-west Texas at an elevation of 5,000–8,000 feet, yet, strange to say, it is tender in Great Britain, "thriving in the open air only in places where the temperature in the winter season does not fall below the freezing point, as in the south of France."—(Veitch's Manual.)

Not in the Sydney Botanic Gardens.

(8.) *J. occidentalis*, Hook.

Sargent, x, t. 521.

"A tree with a straight trunk, 15–25 ft. in height and 2–3 ft. in diameter, with long, stout, spreading branches." (Sargent.)

It grows in Alpine situations, chiefly in the Rocky Mountains, U.S.A., rarely descending below 6,000 feet.

Not in Sydney Botanic Gardens.

(9.) *J. oxycedrus*, L. (Syn. *J. rufescens*, Link). "Oxycedrus" or "Prickly Cedar."

A diœcious spreading shrub, and occasionally a low tree of 9–12 feet.

It is common in the Mediterranean region, ascending to 5,000 feet, but most abundant on arid rocks near the shore.

It is an untidy shrub in the Sydney Botanic Gardens; in other parts of the State it may be a better-shaped plant.

L 6, 7, 14, 15 b (Sydney Botanic Gardens).

Closely allied to *J. Oxycedrus* are the following three species:—

1. *J. brevifolia*, Parlat. From the Azores.
2. *J. cedrus*, Webb. From the Canary Islands. These two forms are not in the Sydney Botanic Gardens, and should succeed with us.
3. *J. macrocarpa*, Sibth.

From localities similar to those of *J. Oxycedrus*. They grow lop-sided with us unless in sheltered situations.

L 17, 31 a, 31 b (Sydney Botanic Gardens).

(10.) *J. pachyphlæa*, Torrey. The "Thick-barked Juniper."

A tall tree of 50 60 feet in height.

A dry country species, inhabiting dry mountain slopes in Mexico and Texas, U.S.A., which might be tried in some of our dry country.

Juniperus sphœrica, Lindl.
Botanic Gardens, Sydney.

(11.) *J. phœnicea*, L. "Phoenicean Juniper"

A monœcious, sometimes diœcious, shrub or small tree, native of the Mediterranean region from Portugal to Palestine, and growing on sterile rocky hills near the coast, as well as at higher elevations.

Var. *turbinata* has ovoid or somewhat top-shaped fruits, not spherical as in the common form.

L 16 a. (Sydney Botanic Gardens).

(12.) *J. prostrata*, Pers.

A prostrate shrub with elongated branches lying flat on the ground and much ramified.

"It is the American representative of the Savin of Europe. It inhabits cold localities in the northern United States and Canada. It is recommended as a useful plant for the rock garden and for covering exposed banks, forming dense masses of foliage which cover a considerable area when the plants are allowed to grow unchecked" (Veitch's Manual.)

It might be tried in the colder parts of this State.

(13.) *J. rigida*, Sieb. and Zucc.

Figured in *Flora Japonica* ii, 109, t, 125.

A small tree of 20–25 feet high. A species looked upon as the Japanese representative of the common Juniper. In Sydney it is quite a slow grower.

L 1, 11 a (Sydney Botanic Gardens).

(14.) *J. sabina*, L. "Common Savin or Savin Juniper."

For a figure and full account of this plant, see Bentley and Trimen's *Medicinal Plants*.

A shrub, sometimes arborescent, and often procumbent or prostrate.

It is common on the mountains of Central Europe, often ascending to a considerable elevation. It does fairly well in the Sydney district.

The leaves are used in medicine.

M 12, M 14, L 13, L 35 a (Sydney Botanic Gardens).

(15.) *J. sphærica*, Lindl "Globe-fruited Juniper." See Paxton's *Flower Garden*, 1850, 58, f. 35.

A tree of the habit and aspect of *J. chinensis*, attaining a height of 30-40 feet. It is a native of China.

One of the best of the Junipers for the Sydney district.

L 6, 11, 34 a, 35 c, 30 b, 31 b (Sydney Botanic Gardens).

(16.) *J. thurifera*, L. "Spanish or Incense Juniper." Figured in "Veitch's Manual."

A low or medium-sized tree of columnar or sub-pyramidal outline, in places attaining a height of 35–40 feet. Fruits small, globose-ovoid, dark, brownish, violet, with a glaucous bloom.

It has a limited geographical range in the western Mediterranean region, from Cape St. Vincent, Portugal, eastward to Sierra Nevada in Spain (ascending to 3,500 feet), and extending also to the coast range of Morocco and Algiers

It is not in the Sydney Botanic Gardens at the present time.

(17.) *J. virginiana*, L. "Red Cedar" of America and England.

A tree of variable size and habit; at its greatest development 100 feet high, with a straight trunk of 3–4 feet in diameter.

It is extensively diffused in North America, extending over a wide range with great variation of temperature.

Juniperus viriginiana, L.
State Nursery, Campbelltown.

Its timber is very valuable, and is extensively used in the manufacture of lead pencils; the chips are used in the manufacture of Cedar-leaf oil.

It does fairly well in Sydney.

L 7 (Sydney Botanic Gardens).

There is a var. *argentea* at L 15 a (Sydney Botanic Gardens).

(*To be continued.*)

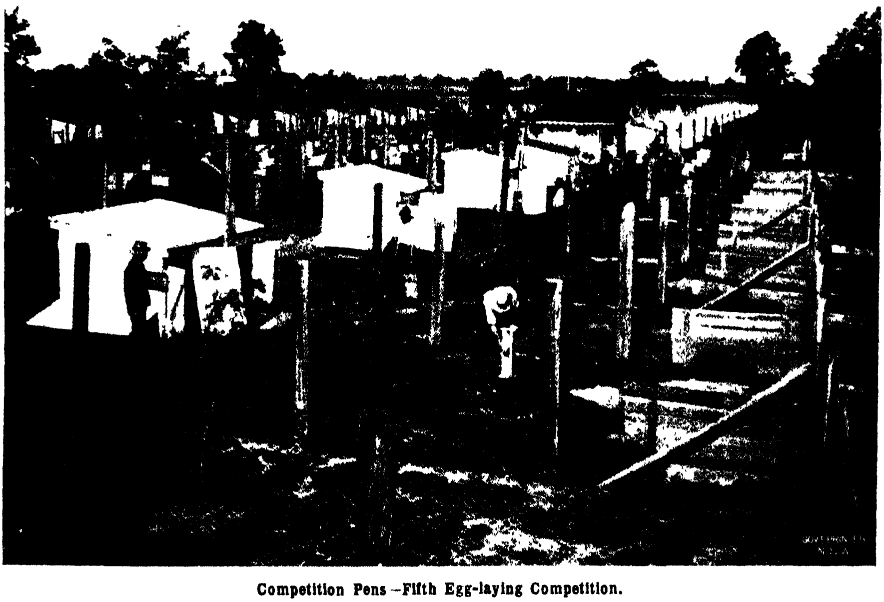
Hawkesbury Agricultural College and Experimental Farm.

REPORT OF THE FIFTH ANNUAL EGG-LAYING COMPETITION—WINTER AND SUMMER TEST—1ST APRIL, 1906, TO 31ST MARCH, 1907.

D. S. THOMPSON,
Poultry Expert, Hawkesbury Agricultural College.

The Initiation.

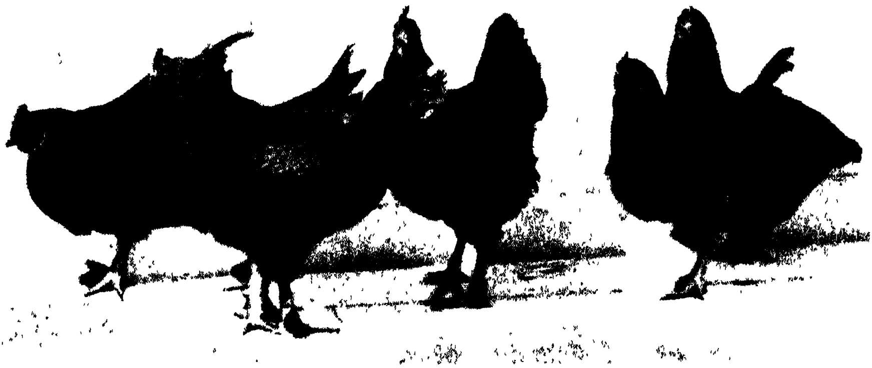
THESE competitions, so successfully carried out over a period of five years at the College, had their origin in a controversy in the columns of the *Daily Telegraph*, and was full of interest to poultry breeders.



Competition Pens—Fifth Egg-laying Competition.

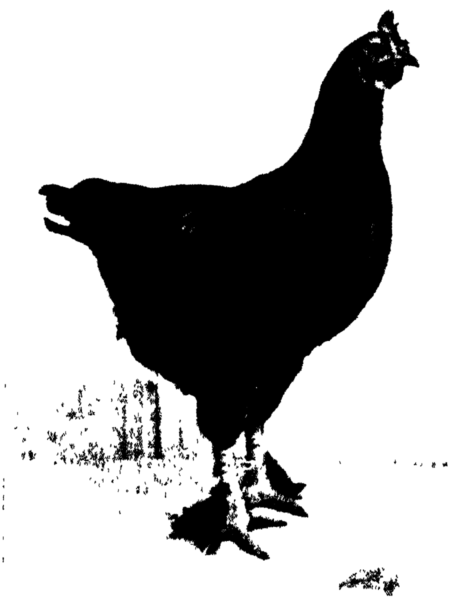
A couple of breeders, the one advocating Buff Orpingtons and the other Silver Wyandottes, eagerly disparaged their opponent's pet birds, with the result that the Poultry Editor of the journal referred to suggested that six representatives of each breed should be tested at the Hawkesbury College.

This brought forward a host of suggestions from other poultry men, advising that it should be made an open competition for all breeders and any breeds. The idea was at once acted upon by the management of the *Daily Telegraph*,



First Pen—Langshans. J. R. Wakfer.

and a sum of £21 donated for prize money. In regard to the initiation that paper wrote,—"To all it must be patent that such a competition will be fruitful of good results by arousing a keener interest in improving one of the two chief utility points of fowls. To many people a hen is a hen, whether she lays 50 or 150 eggs in a year. This test will bring forcibly under the notice of poultry keepers the fact that there are breeds and strains that will give a maximum of egg production without an increase in the cost of keeping, and it must also tend to stimulate and develop that most important branch of the poultry industry." After a large number of competitors had entered a committee was formed, and rules and regulations drawn up. A deputation was appointed to wait on the Honorable John Kidd, Minister for Mines and Agriculture, who, on the advice of the Director of Agriculture, and after consultation with the



Langshan. J. R. Wakfer.

Principal of the College, agreed to have the necessary number of pens erected at the Hawkesbury College. The competitors elected by ballot from among

Second Pen—White Leghorns. S. Ellis.

their number the following gentlemen as a committee:—Messrs. James E. Pemell, L. L. Ramsay, W. Harris, A. E. Henry, and H. E. Kelly to act in conjunction with the Director of Agriculture (Mr. W. S. Campbell) and the Principal of the College, Mr. George Valder (and subsequently his successor, Mr. H. W. Potts), and the Poultry Expert, Mr. D. S. Thompson, with Mr. A. A. Dunnicliffe, junr., representing the *Daily Telegraph*.

In opening the first meeting of the Committee, Mr. James Pemell, who was unanimously appointed chairman, said he considered the competition of great moment, not only to the competitors, but to the poultry-keepers of the whole State. Further, the matter was

White Leghorn. S. Ellis.

already being discussed and followed with interest in the other States, and the results would be published throughout the world. It was the desire of the committee to make the competition a source of education to poultry-keepers, and to show the world the high standard the industry had attained here in the mother State of the Commonwealth. They were prophetic words, for the series of competitions has been a great source of education, and the poultry press has been glad of the information so practically demonstrated. Again the hens of New South Wales have shown that they can, not only hold their own, but out-distance all competitors sent from elsewhere.

Rules and Regulations.

These were drawn up to govern the competition—

1. The competition to commence on the 1st April and extend to 30th September, a period of six months calendar.
2. The competitors will be bound to pen their birds during March, each pen to consist of six pullets or hens of any age, no male bird to be included.
3. All birds to be bred by the competitor.
4. All birds to be examined by the Poultry Expert on arrival at the College, and any found to be suffering from infectious or contagious disease to be rejected; in the event of a bird dying, the competitor to be allowed to replace it.
5. All eggs to become the property of the Department of Agriculture.
6. The competition to be decided by the greatest total number of eggs laid by each pen, eggs under 1¾ oz not to count.
7. The market value of the eggs laid to be recorded and the weight of eggs from each pen, and prizes given for the greatest aggregate weight.
8. Records to be kept of the total quantities of the various foods consumed and the average cost per head.

A General Retrospect.

In reference to the objects of the competition, the following appeared in the *Daily Telegraph* of 24th May, 1902:—"It has been argued in some quarters that laying competitions do not attain their object, because they do not definitely settle the rival merits of various breeds of fowls. It has never been claimed by those interested in the competition now in progress at the Hawkesbury College that should Silver Wyandottes, for instance, head the list, they could be incontrovertibly proclaimed the best laying fowl. The competition has quite a different object. The aim of the promoters is to stimulate and encourage the laying branch of the poultry industry, and bring home to poultry-keepers the fact that, by devoting attention to this subject, they can get a relatively greater return from their birds. Do shows of pure-bred poultry decide which is the best bird for the table, for laying, or for general utility purposes? No; but by their direct and indirect influence they improve the standard of the whole community. Did the £50 which the Government expended in national prizes for export at the Sydney shows last year settle the question which was the best cross for export? No; but these

prizes, without doubt, encouraged the breeding of a better class of table birds. What would be the standard of the poultry of the State to-day if there had been no shows? In the exhibitions, form and colour alone count; even in the laying breeds, a hen may win a championship whether she has ever laid an egg or not. Exhibitions ignore—they cannot do otherwise—the laying qualities of the fowls. The province of laying competitions is to improve the egg-producing standard of poultry." That motive alone would be a worthy one for carrying out such tests, but the practical results have added more valuable data. The egg-producing standard has been greatly increased. The average laying per hen has increased from a total of 130 per hen from 228 hens in the first test, to 171 eggs per hen from 600 hens in the fifth. Moreover, the quality of the stock has also greatly improved in stamina and in size, while the general feather characteristics were also greatly improved; the type, size, and colour of all birds in the fifth test being much nearer to show standard than in the first. It has also clearly demonstrated that there are good, better, and best breeds as well as strains. The competitors themselves have not been slow to notice and act on it, by the selection of the best breeds for laying, as is clearly evidenced by these tests. The competitions have attracted hundreds of visitors interested in the work from many parts of the world, including Mr. Simon Hunter, one of England's veteran and premier poultry breeders, and the example set has now been followed by every State in the Commonwealth, with the exception of Tasmania, but including New Zealand. The United States has at last inaugurated an egg-laying competition somewhat on the same lines as the Australian competitions, while conservative England is waking up to the fact that few data of any value can be obtained from tests lasting but a few weeks.

To the students at the College it has been an ever-present and the best possible object-lesson on utility poultry-keeping, and the various tests, with their results, have been closely followed throughout. It would be difficult to over-estimate their value in this respect, just as it would be to overrate influence in awakening the majority of poultry-keepers to the fact that efforts to work up strains of fowls which will give double the eggs on the food will pay handsomely. Some of our most experienced breeders have found that their birds, hitherto considered first-class layers in open competition on equal conditions with others, were far from being the best breeds and the best strains for profitable egg production. This series of five years' tests is only the beginning, and, like all new ventures, has been annually improved and is still open to improvement in detail, viewed in the light of experience. With the lessons learned, it is only reasonable to assume that future contests will be increasingly helpful to the great industry they are intended to foster.

Locality and Site.

The locality of the egg-laying test can be put down as favourable. It is within the 86-mile radius of Sydney, which is the second radius charge for freight to and from the chief market, the first being within 22 miles. The site on which the pens are placed is almost a dead level, and the only drainage is the porous nature of the soil. Consequently the site is not a good

one for poultry. The best site would be sloping ground towards the north-east, with good natural rapid drainage, and an early rising of the dew in the morning. The ground is of a sandy loam, which is an ideal soil for poultry farming, as the whole yard is a scratching pen. The surface is

Third Pen—White Leghorns. G. H. Arkinstall.

heavily grassed with couch (*Cynodon dactylon*); no better green food can be provided for poultry. It is essential that the couch should get a good start, evidence of which was given in the first test, when a few of the pens were completely eaten bare of any vestige of grass—even the roots being completely eaten out by the hens, so that it was necessary to plant sods of couch to re-grass these pens.

Yards and Houses.

These tests have amply proved that the question of yarding and housing poultry must not be neglected. To make a profit from poultry now-a-days, everything must be up to date. The tests have proved that poultry distributed over a large number of pens will bring far greater profits than when run together in one or two pens; also, that birds comfortably housed will be more likely to put out a larger percentage of their eggs in the early winter months, when eggs are high in price, than they would otherwise do, if not well protected from winds and rain. The houses for the competition were designed and substantially built by the foreman of works, Mr. Brooks. They are entirely open in front for the greater part of the year, and for the winter months the front is closed up with a portable shutter. The houses are very closely built, and when shut up in winter not a crevice or crack can be found anywhere except at the right apertures in front and behind necessary for ventilation.

Ample space for exercise acts as a good stimulant towards the best health conditions and a preventive of disease. The swinging perches are suspended from the roof with iron rods, and no lumber in the house. Bottomless nests are provided outside the building. To these precautions we attribute the absence of vermin of any kind in the houses during the course of the five years' tests.

The bottomless nests are filled with grass, which is found to be the softest and most durable material. This is important, as many eggs are easily broken if the nest is not well filled with nice elastic material. The nests are periodically dusted with tobacco refuse, purchased at a cost of about 3d. per lb., to keep down lice and allow the hens to lay comfortably, without being worried to death.

The yards are 87 feet x 17 feet, and the fences are of 6 feet wire-netting supported on powerful ironbark posts which will last a lifetime.

Behind every laying pen there is a broody pen, 10 feet x 17 feet, and here the broodies are immediately isolated on showing the least sign of tarrying on the nest. This is essential to keep them laying constantly. Each house is divided into two compartments, the entire building being 11 feet x 6 feet, and 5 feet high in front and 4½ feet at the back. The roofing is of Ruberoid with board lining, and the house is very cool in the hottest weather, and makes an excellent shade retreat at any time of the day. The soil of the

Fifth Pen—Black Orpingtons. R. H. Blamey.

test pens is almost pure sand, and the greatest difficulty has been experienced in connection with shade trees. Acacias, pines, and peppers have been found the best; and on the principle of try, try, try again there is hope that trees will yet be seen flourishing luxuriantly in the competition pens.

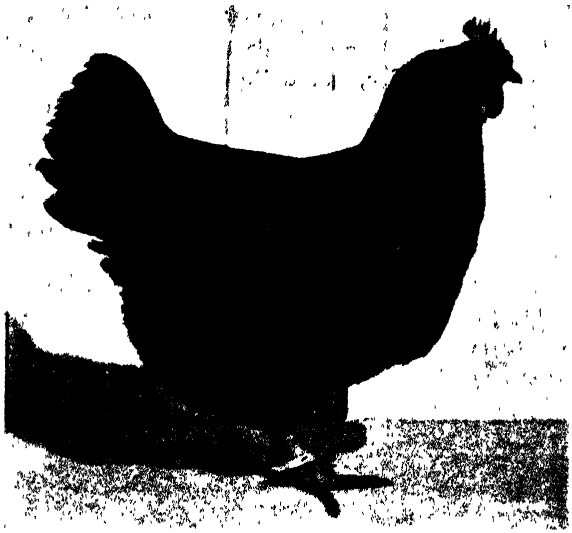
Breeds and Breeding.

The first competition which was inaugurated, as will be noticed from the published Rules and Regulations was for six months only, but it was soon realised by the committee, the conductor, and the competitors themselves, that while valuable information could be obtained from six months tests, it would have to be continued the full twelve months for reliable data, and even now the time has been extended to twenty-four months to ensure the complete details. The original challenge was for the largest output of eggs for the winter and this was held to be the most meritorious performance, and so it is, but if hens lay a large number of eggs in the cold weather only, and then refuse to lay later on when it is hot, that breed, much as they would be profitable for the few months would not be worth keeping for a longer time, and so the first test was unanimously extended to the full year, a complete cycle of seasons. Since the competitions started a good many breeds after being

Sixth Pen—Black Orpingtons. H. E. Kelly.

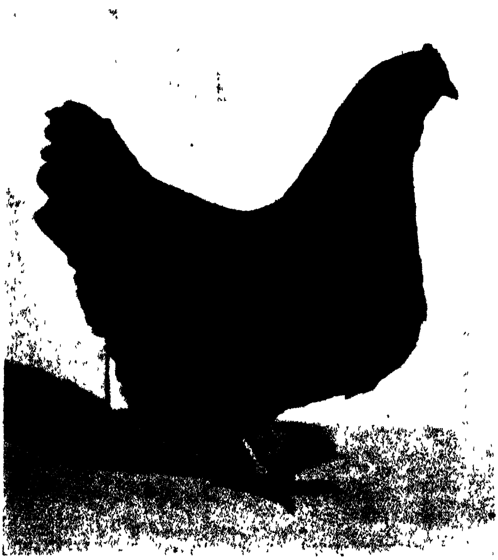
tested have dropped out of the running. The competitions have been open to all breeds of fowls, one recognised rule of the committee being always to have as many breeds as possible, so long as competitors could be found willing to enter them. The following have been dropped out by the competitors which can be taken by the general reader as a good criterion of their laying capacity. Anconas, White Orpingtons, Jubilee Orpingtons, Pile Leghorns, Golden Wyandottes, Silver Pencilled Wyandottes, Golden Pencilled (Partridge) Wyandottes, White Rocks, Campines, Old English Game, Faverolles, and Houdans, and the following breeds have either decreased or remained about the same, White Wyandottes, Buff Orpingtons, Buff Leghorns, Buff Wyandottes, Andalusians, Minorcas, Brown Leghorns, and Langshans. White Leghorns, Black Orpingtons, and Silver Wyandottes have rapidly increased in popularity, and there would be no difficulty in filling a competition of 200 pens with these, which stamp them in the

minds of poultry-men as the three best laying breeds of the State.



Black Orpington. H. E. Kelly.

The second and third contests were made International, and the Americans sent, White Wyandottes, Rose-comb Brown Leghorns, Rose-comb White Leghorns, Rhode Island Reds, and Silver Pencilled Wyandottes, some of them must have been selected more for novelty than for winning a stiff egg-laying competition, at any rate, with the exception of White Wyandottes, all the others were comparatively new breeds in America, and these tests have demonstrated very clearly that new varieties like the Silver Pencilled Wyandotte, which has to be so much in-bred for feather and marking, could never be expected to have the stamina, even if they had been line-bred for eggs for a short time, to win a competition which requires considerably over 200 eggs per hen to win. The American Leghorns laid remarkably well, and although as Rose-combs they were comparatively new, there is not the same inbreeding necessary for colour as in a breed like the Silver Pencilled Wyandotte.



Black Orpington. S. Gordon.

It will be seen that the tests have demonstrated that Silver Wyandottes and Black Orpingtons are always ahead of the White Leghorns for winter eggs, and the same thing is noticed in the fall, the beginning, and the end of the tests when, at both these seasons, eggs attain high prices, and the same thing is already obvious in second year's hens.

Weather Conditions.

The weather has a great deal to do with profitable egg production. Mild, comparatively dry, and uniform weather has been found the ideal for egg production. Cold winds, dampness, sudden climatic changes, and heavy continued rains have been found to militate against it. During the series, all kinds of weather have been experienced, but nothing retarded the egg output more than the cold, heavy rains experienced in July, 1904, when 11 inches of rain fell over a period of nineteen days. This was coupled with the fact that the weather for the previous six months had been cold, wet, and bleak, so that even when it was not actually raining the ground was sodden, making the whole atmosphere chilly, with very little sunshine. As an instance of the effects of this continued damp weather culminating in excessive rain, it is only necessary to mention that in three days the egg output instantly fell from 333 to 177. The following year the conditions were

White Leghorns. A. D. Craig.

almost reversed, the test of 1905-6 being much more favourable to egg production than its predecessor. Certainly wet weather was experienced just at the commencement, but afterwards dry weather continued throughout the winter and during the spring and summer following. The winter was a severe one for frosts, fifty-seven being recorded for June, July, and August, while for the whole quarter only 94 points of rain fell, and the output was a record over the three previous tests.

The worst weather was experienced in January, 1906, the heat throughout the month being exceptionally trying. The thermometer showed many high readings, but the culminating point was reached on the 24th, when the glass showed 112·6 F. at the College Observatory. The temperature was found to be too great a strain on the laying hens, and many of them died on the nests, the immediate cause of death being apoplexy from distention of the oviduct, which is always fatal.

General Attention.

Next to regular and systematic feeding comes the general attention to the poultry yard to make the profits. The houses are kept scrupulously clean, there being nothing but the bare floor space. The floors are easily and rapidly swept up—one reason being the splendid ventilation and open sunlight which makes the whole of the droppings harden, and with a light sand covering on the floors they are easily collected and removed. The swinging roosts receive an occasional drenching of kerosene. The water is renewed daily and the dish cleaned out once a week. The simplest plan of water utensil has been found the best. It is necessary to keep the water in the shade, in order that the fowls can reach it without going in the sun. Shell grit is provided and is placed in boxes, the reason for this being that it can easily be seen what quantity of grit is before them and when it requires renewing. The shell grit would be much better placed in the sand or scratching pens, but it would be impossible to know when to renew it. The eggs are gathered daily, and no nest eggs are left in the nest.

White Leghorn. A. D. Craig.

A keen watch is kept on the health of the fowls, and if they show signs of failing appetite, a loosening diet of a larger percentage of bran in the mash with a half-pound of Epsom salts per 100 fowls is given. So long as they are laying well and eating well they are not to be interfered with in any way further than slightly changing the diet and varying the foods, but no sudden change of diet is made. In the case of sickness, the patient is isolated at once.

Foods and Feeding.

Soft food, consisting of a mash of bran and pollard, is given in the morning at 7 a.m. For green food, couch grass, rape, lucerne, clover are provided daily at 10 a.m.; while for meat food, ox livers have been found the best and cheapest. At 4·30 the afternoon feed of grain is given—either wheat or maize; this is regulated somewhat by the price.

Mortality and Disease.

During the currency of the five years' tests no contagious diseases of any importance has been discovered. This speaks well for the general vitality and stamina of the hens sent in for competition. The deaths range from 3 per cent. to 9 per cent., and most of them occurred from ovarian weakness. Chicken pox made its appearance in the two last competitions, but with careful attention the disease was soon dispelled. Scaly leg (*Sarcoptes mutans*) has been met with more or less in each competition, but it is far less frequent now than at the beginning of these tests. The yards and houses in continuous use for five years are just as free from disease as when in their virgin state.

The following is a *résumé* of the general report which appeared in the *Daily Telegraph* of April 1st containing the records.

EGG-LAYING COMPETITION AT THE HAWKESBURY AGRICULTURAL COLLEGE.

FIFTH ANNUAL TEST.

The fifth annual egg-laying competition organised by *The Daily Telegraph*, and conducted under the personal supervision of Mr. D. S. Thompson, Government Poultry Expert, at the Hawkesbury Agricultural College, terminated yesterday. The executive management was in the hands of a committee consisting of Messrs. W. S. Campbell (Director of Agriculture), H. W. Potts (Principal, Hawkesbury Agricultural College), D. S. Thompson, A. A. Dunnicliff, jun. (*The Daily Telegraph*), and J. Hadlington, A. E. Henry, L. L. Ramsay, J. Stewart, and S. Ellis (competitors' representatives).

The competition was in every respect the most successful of the series, and the steadily improving results which have been obtained are of themselves an abundant justification of the objects the promoters have kept steadfastly in view, in carrying out their policy of keeping the tests running continuously as an ever-present incentive and object lesson to the poultry-keepers of the State. And it may be said that the data accumulated has been accepted and valued by the whole poultry world, as being authentic and valuable records. The fact that the splendid results achieved have been the outcome of simple, though, of course, systematic feeding and attention enhances their usefulness, because the methods by which they were secured are adaptable to the conditions of the working poultry-farmer.

Future Competitions.

The series of five tests of twelve months' duration having been completed, the committee decided to break new ground, and set about collecting data such as has not yet been obtained in any other part of the world. The first twelve months' competition ever carried out anywhere was the initial one of this series, and the Hawkesbury College will again lead the way as the pioneer of competitions extending over a period of two years. All future tests will be of that duration. In furtherance of this object, forty of the pens have been re-entered for another twelve months, to complete the first two years' test, and as a hen's life as a profitable layer is generally put down as two years, the extension promises to result in the most valuable experimental work yet attempted in connection with this branch of poultry culture.

The Winning Pen.

The remarkable achievement of the winning pen in eclipsing all previous records, with a good margin to spare, is all the more interesting from the fact that the hens are the direct progeny of fowls brought from Langshan, China, by their owner. They are, consequently, to all intents and purposes a different breed to the modern British Langshan. Their condition throughout has been exceptional, and they finish as fit and well as they started. They remain at the college for the second year's ordeal, and they look quite equal to making things warm again for all rivals. They showed a fair amount of broodiness, but were easily broken off, and were almost invariably back in their pen at work again after two or three days' incarceration.

The Prize Winners.

The prize money, amounting to £125, including £50 donated by *The Daily Telegraph*, was won as follows, only pens laying eggs weighing 24 oz. per dozen before the expiration of the first four months being eligible for a prize :—

For number of eggs in the twelve months :—

	£	s	d.		£	s.	d.
1. J. R. Wakfer	10	0	0	11. L. Greentree	1	0	0
2. S. Ellis	8	0	0	12. J. Stewart	1	0	0
3. G. H. Arkinstall	7	0	0	13. A. H. Hobden	1	0	0
4. R. H. Blamey	6	0	0	14. J. R. Douglas	1	0	0
5. H. E. Kelly...	5	0	0	15. Heydon and Shepherd ...	1	0	0
6. S. Gordon	4	0	0	16. W. J. Leaver	1	0	0
7. A. D. Craig...	3	0	0	17. P. Allder	1	0	0
8. M. Ireland	3	0	0	18. W. O. Hudson	1	0	0
9. Mrs. T. Partridge	2	0	0	19. T. Maguire	1	0	0
10. A. E. Cooke...	2	0	0	20. S. Wade, jun.	1	0	0

Winter test (first four months) :—

	£	s.	d.		£	s.	d.
1. J. R. Wakfer	5	0	0	6. G. H. Arkinstall	1	10	0
2. J. Gamble	4	0	0	7. Mrs. E. Scaysbrook	1	0	0
3. R. H. Blamey	3	0	0	8. J. Stewart	0	10	0
4. W. O. Hudson	2	10	0	9. E. J. Winton...	0	10	0
5. S. Wade, jun.	2	0	0				

Market value of eggs for the twelve months :—

	£	s.	d.		£	s.	d.
1. J. R. Wakfer...	4	0	0	5. H. E. Kelly	1	10	0
2. S. Ellis	3	0	0	6. S. Gordon	1	0	0
3. G. H. Arkinstall	2	10	0	7. J. Gamble	0	10	0
4. R. H. Blamey	2	0	0	8. J. Stewart	0	10	0

Number of eggs first month :—

	£	s.	d.		£	s.	d.
1. J. R. Wakfer and J. Anderson (equal), each	1	15	0	3. J. Gamble	0	10	0

Number ot eggs last three months :-

	£	s.	d.		£	s.	d.
1. S. Ellis, 351 eggs	2	0	0	3. A. E. Cooke, 337 eggs ...	1	0	0
2. J. R. Wakfer, 342 eggs ...	1	10	0	4. J. R. Douglas, 308 eggs ...	0	10	0

General utility prizes (open to hens averaging at least 6 lb. in weight on March 1, 1907, decided by the number of eggs laid) :—

	£	s.	d.		£	s.	d.
1. R. H. Blamey, total weight of hens 39½ lb.	4	0	0	3. M. Ireland, 39½ lb.	2	0	0
2. H. E. Kelly, 39½ lb.... . .	3	0	0	4. L. Greentree, 36 lb.	1	0	0

Monthly prizes of £1 for the greatest number of eggs from a pen, April excepted :—

May, J. Gamble...	127 eggs	November, Mrs. T. Partridge...	142 eggs
June, R. H. Blamey	129 ,,	December, A D. Craig... ...	137 ,,
July, J. R. Wakfer	151 ,,	January, S. Ellis	137 ,,
August, J. R. Wakfer... ...	162 ,,	February, S. Ellis	112 ,,
September, H. E. Kelly ...	153 ,,	March, J. R. Wakfer	117 ,,
October, P. Allder	152 ,,		

Comparison of Results.

The following compares the results of the five competitions :—

	1st	2nd	3rd	4th	5th
Number of pens	38	70	100	100	100
Winning pen's total	1,113	1,308	1,224	1,411	1,481
Lowest pen's total	459	666	532	635	721
Highest monthly total	137	160	154	168	162
Average laying per hen	130	163	152	166	171
Greatest value of eggs	140/3	150/4	113/10	125/6	137/1
Average price of eggs	1/1	1/3¼	1/-	/11½	12½
Average value per hen	15/6	17/9½	12/9	13/3½	14/10
Cost of feed per hen	6/-	6/9¾	4/5½	5/3½	5/10
Profit over feed per hen	9/6	11/11¾	8/3½	8/-	9/-

The analyses of the average production of and the value of the eggs laid by the various breeds are as follow :—

Breed.	Eggs per Hen.	Value per Hen
6 Cuckoo Leghorns	190·16	16/10½
18 Langshans	188·88	16/10
120 Black Orpingtons	178·41	15/8½
30 S.C. Brown Leghorns	177·00	14/10
138 S.C. White Leghorns	174·93	14/8¼
12 R.C. Brown Leghorns	173·50	14/8½
12 R.C. White Leghorns	172·66	15/1
12 Golden Wyandottes	171·33	15/5
126 Silver Wyandottes	170·51	15/1½
24 Minorcas	168·91	14/-
6 Rhode Island Reds	166·66	14/2
6 Partridge Wyandottes	164·16	13/7½
12 Buff Wyandottes	163·75	14/10
18 Buff Leghorns	160·55	14/-
18 Buff Orpingtons	150·11	14/1
24 White Wyandottes	146·70	12/7½
6 Black Leghorns	138·33	10/9
6 Houdans	137·33	10/3
3 Faverolles	126·66	9/10

Financial Result and Records.

The price of produce was rather above normal for the fifth test, the average price of wheat being 3s. 3d., maize 2s. 9d., while the College held a contract for the supply of bran and pollard at 11d. and 1s. respectively. The total cost of feeding the 600 hens was :—Wheat, £48 15s. ; maize, £32 10s. ; bran and pollard, £53 5s. ; meat, £25 ; lucerne, £6 ; shell grit, £4 ; incidentals, £1. Total, £170 10s.

The monthly laying was :—April, 5,645 eggs ; May, 6,854 ; June, 7,032 ; July, 9,528 ; August, 12,292 ; September, 11,940 ; October, 11,294 ; November, 9,548 ; December, 8,466 ; January, 8,084 ; February, 6,948 ; March, 5,278. Grand total, 102,909 eggs, or 8,575 dozen.

The monthly range of prices for first-grade eggs was :—April, 1s. 7d. to 1s. 10d. ; May, 1s. 10d. to 1s. 5d. ; June, 1s. 9d. to 1s. 3d. ; July, 1s. 5d. to 11d. ; August, 10d. to 8½d. ; September, 9d. to 8½d. ; October, 8½d. to 8¾d. ; November, 9d. to 1s. ; December, 10½d. to 1s. ; January, 1s. 2d. to 1s. ; February, 1s. 3d. to 1s. 6d. ; March, 1s. 2d. to 1s. 9d. per dozen.

The total net market value of the eggs was £444 13s. 2d., from which deduct the cost of feed, £170 10s., and a surplus of £274 3s. 2d. remains.

The appended table gives full details of the eggs laid and the net market value of the eggs from each pen of six hens.

EGGS laid, and net market value of the eggs from each hen.

Owner, Address, Breed.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	January.	Feb.	March.	Total.	Weight per doz.	Market Value.
														oz.	
1. J. R. Wakfer, Chatswood : Langshans	126	106	121	151	162	128	129	117	99	123	102	117	1481	25	137/1
2. S. Ellis, Botany : White Leghorns	59	109	101	122	148	147	142	130	128	137	112	102	1437	27	128/
3. G. H. Arkinstall, Inverell : White Leghorns	82	79	111	130	150	142	142	123	112	114	101	87	1373	25	122/8
4. W. R. Wilson, Hillgrove : Golden Wyandottes	94	103	126	118	129	133	128	110	98	107	98	98	1335	22	122/8
5. R. H. Blamey, Kogarah : Black Orpingtons	46	111	129	144	153	151	119	103	88	69	88	55	1256	27½	111/9
6. H. E. Kelly, Ashfield : Black Orpingtons	45	97	115	122	135	153	121	115	97	82	82	90	1254	24	110/7
7. S. Gordon, St. Ives : Black Orpingtons	65	73	114	139	149	130	132	113	85	64	97	86	1247	25	110/2
8. A. D. Craig, Baulkham Hills : White Leghorns	33	102	71	72	127	136	141	120	137	133	106	44	1222	26½	105/3
9. M. Ireland, Cumnock : Black Orpingtons	58	62	61	122	148	146	141	112	107	100	85	78	1220	27	104/4
10. Mrs. T. Partridge, Marrickville : White Leghorns	73	106	22	46	138	145	141	142	118	119	96	68	1214	26	105/1
11. A. E. Cooke, Colo Vale : Brown Leghorns	44	70	61	62	119	129	148	124	115	134	110	93	1209	26½	104/6
12. L. Greentree, Wilberforce : Silver Wyandottes	67	96	98	124	138	133	131	93	77	97	61	79	1194	24	104/6
13. J. Stewart, Berowra : White Leghorns	100	78	90	127	136	123	118	103	94	85	76	63	1193	26	106/9
14. A. H. Hobden, Singleton : Buff Leghorns	81	50	61	110	140	139	146	108	91	102	82	66	1176	25	101/-
15. J. R. Douglas, Willoughby : Minorcas	80	65	42	70	136	136	138	102	90	111	97	102	1169	25½	102/9
16. Heydon and Shepherd, Brucedale : Brown Leghorns	50	63	52	105	136	141	139	124	101	120	97	41	1169	26½	97/5
17. W. J. Leaver, Moss Vale : Silver Wyandottes	66	84	86	132	138	138	124	99	88	74	76	62	1167	26	102/3
18. P. Allder, Bankstown : White Leghorns	22	77	105	109	136	138	152	111	118	93	62	40	1163	26	96/8
19. W. O. Hudson, North Ryde : Black Orpingtons	64	112	118	125	139	122	109	90	87	69	64	58	1157	27½	104/4
20. T. Maguire, Mittagong : White Leghorns	114	74	67	117	143	137	142	113	89	82	53	20	1151	25½	99/-
21. S. Wade, jun., Tamworth : Silver Wyandottes	69	118	109	111	130	124	114	82	64	91	67	71	1150	25½	104/9
22. Miss M. McDonald, Five Dock : Silver Wyandottes	43	82	119	135	110	129	108	93	79	89	84	78	1149	26	103/4
23. J. Gamble, Ashfield : Black Orpingtons	125	127	114	128	137	115	75	76	73	54	49	69	1142	26	109/4
24. W. Mitchell, North Ryde : Cuckoo Leghorns	33	94	108	96	132	125	119	108	69	94	89	74	1141	25½	101/3
25. B. Poole, Leichhardt : Silver Wyandottes	61	107	97	123	129	128	112	88	89	66	62	76	1138	23	101/-
26. A. A. Beaumont, Peakhurst : White Leghorns	63	28	63	63	118	135	135	130	123	131	98	47	1134	26	95/6
27. Mrs. L. Calder, Waitara : Black Orpingtons	81	81	96	135	146	127	106	81	76	66	79	59	1133	27	101/4
28. F. J. Brierley, Carlingford : White Leghorns	55	70	49	106	142	124	130	110	102	89	86	70	1133	25	96/9
29. T. A. Hutchinson, Manly : Brown Leghorns	43	84	113	100	131	132	131	119	106	75	63	36	1133	23½	96/4
30. J. A. Baird, Five Dock : Black Orpingtons	103	102	69	84	137	125	109	103	85	85	65	65	1132	24	104/-
31. G. W. Hanna, Croydon : R. C. W. Leghorns	47	72	78	127	136	125	122	110	81	78	76	57	1109	23½	94/9
32. A. J. Lurcock, Glenreagh : Black Orpingtons	13	73	124	116	135	130	108	80	94	82	69	85	1109	27	94/9
33. Mrs. E. Scaysbrook, Gosford : Black Orpingtons	110	110	70	109	113	108	99	94	77	79	62	77	1108	26	103/9
34. G. Howell, Wentworthville : Black Orpingtons	39	88	98	109	132	137	129	105	95	76	52	41	1101	26	92/9
35. C. N. Soutter, Tuggerah : Buff Orpingtons	47	73	103	118	134	106	105	96	77	88	76	73	1096	26	97/6
36. L. W. Nicholson, The Oaks : Silver Wyandottes	54	94	66	121	132	115	111	92	80	69	82	69	1085	26	95/4
37. Ventura P. Farm, Miranda : Silver Wyandottes	102	114	89	85	111	116	103	94	86	70	65	47	1082	24½	100/3
38. J. Anderson, Guildford : Silver Wyandottes	126	76	82	98	107	92	107	103	81	71	66	68	1077	26	99/3
39. J. Skinner, Lewisham : R. C. B. Leghorns	8	71	81	59	110	129	131	128	108	107	85	59	1076	22	89/9
40. Stewart Bros., Berowra : White Wyandottes	88	95	82	99	107	112	110	71	80	77	79	69	1069	25	94/8
41. L. L. Ramsay, Carlingford : Black Orpingtons	64	86	74	103	138	124	101	93	90	66	54	71	1064	26½	93/6
42. Mrs. C. Burke, Naremburn : Silver Wyandottes	31	84	111	116	135	105	103	74	66	88	72	72	1057	24½	94/5
43. E. J. Winton, Campbelltown : Langshans	46	93	118	137	136	128	123	79	58	49	73	7	1047	26	91/9
44. J. Loughman, Maclean : Black Orpingtons	43	75	79	104	118	113	99	90	88	94	77	57	1037	25	91/7
45. H. A. Kennedy, Miranda : Silver Wyandottes	114	75	86	95	103	100	96	81	73	74	75	64	1036	24	96/7
46. Veness and Fox, Ashfield : Silver Wyandottes	82	83	71	99	141	99	113	82	71	75	62	52	1035	25½	92/9
47. E. F. Silcock, Armidale : Silver Wyandottes	106	87	52	112	121	117	110	81	55	80	65	49	1035	25	87/8
48. W. A. Wooderson, Berowra : White Leghorns	79	84	63	111	131	130	114	95	86	79	38	23	1033	25	89/3
49. A. J. Wood, Quirindi : Minorcas	23	40	78	81	120	137	139	119	80	94	67	47	1025	27	82/-
50. Minter and Docker, Parramatta : White Leghorns	10	21	49	117	130	134	127	126	110	102	64	34	1024	29	78/8

EGGS laid, and net market value of the eggs from each hen—*continued.*

Owner, Address, Breed.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	January.	Feb.	March.	Total.	Weight per doz.	Market Value.
														oz.	
51. H. Luck, Moruya : White Leghorns	11	40	77	89	120	114	123	110	97	110	80	50	1021	26	85/9
52. F. McGrath, Albion Park : Black Orpingtons	55	32	90	119	126	128	97	51	93	86	85	58	1020	25½	89/1
53. J. Ahern, Arncliffe : Black Orpingtons..	92	51	69	106	112	123	112	89	67	75	66	55	1017	25	89/5
54. M. Blanch, Petersham : R.C.B. Leghorns	79	40	39	85	125	110	101	85	107	92	85	58	1006	25	86/8
55. F. J. Wood, Ashfield : Minorcas	53	77	76	57	98	108	117	111	114	98	72	25	1006	26	81/9
56. J. J. Hicks, jun., North Ryde : Buff Orpingtons	68	83	76	124	116	117	89	71	61	80	51	68	1004	26	91/1
57. W. L. Andrew, Beecroft : Rhode Island Reds	73	11	32	101	123	120	102	94	89	95	66	94	1000	26	85/-
58. W. Wild, Lake Albert : Black Orpingtons	38	38	60	121	123	118	124	102	90	81	70	34	999	27	82/4
59. P. Lowe, Lower Portland : White Leghorns	74	48	78	60	116	131	119	117	74	88	41	48	994	25	83/3
60. A. E. Henry, Ryde : Buff Wyandottes ..	44	83	87	113	99	112	83	93	78	77	80	49	998	24	88/-
61. R. E. Warren, Glenfield : White Leghorns	94	45	7	57	124	132	118	107	78	101	71	51	985	25½	83/6
62. Grantham Poultry Farm, Seven Hills : Silver Wyandottes	72	31	39	93	128	128	118	95	85	79	76	41	985	24	83/3
63. P. H. Agnew, Parramatta : Partridge Wyandottes	16	75	43	106	143	121	107	91	86	72	79	46	985	25½	81/9
64. W. J. Napier, North Ryde : White Leghorns	15	58	74	70	105	123	132	117	104	81	71	31	981	25	80/9
65. E. Hyatt, Rooty Hill : White Leghorns	78	65	54	69	120	127	129	103	98	54	56	27	980	25½	82/9
66. J. Taylor, Gordon : Buff Wyandottes	72	109	109	90	102	91	95	65	65	68	66	40	972	22½	90/1
67. S. Kendall, Kiama : Silver Wyandottes..	75	52	33	101	118	117	102	81	80	60	71	82	972	25½	85/4
68. H. Robbins, Galston : Silver Wyandottes	79	66	66	101	112	126	106	94	70	55	39	57	964	25	83/4
69. R. Boardman, Camden : R.C. White Leghorns	69	85	99	110	105	98	95	85	73	72	51	21	963	24½	86/5
70. D. B. Kirk, Merrylands : Silver Wyandottes	61	97	81	90	88	107	111	73	74	63	81	26	952	26	85/6
71. E. S. O'Sullivan, Beecroft : White Leghorns	39	44	42	63	111	127	123	102	114	87	78	19	949	25½	77/-
72. J. Lowe, Baulkham Hills : White Leghorns	49	48	37	68	115	126	119	118	96	76	70	23	945	27½	79/2
73. C. Edginton, Burwood : White Wyandottes	71	79	93	109	123	111	97	70	43	49	54	39	938	24	83/9
74. W. Kirkland, Bowenfels : Silver Wyandottes ..	57	74	51	110	119	101	93	71	71	65	65	59	936	26	82/9
75. A. F. Emmott, Moruya : Brown Leghorns	40	38	41	30	125	121	131	122	100	78	71	29	926	24	74/1
76. Mrs. A. Kohlhardt, Plumpton : Silver Wyandottes	62	42	57	85	122	103	103	92	78	64	68	31	907	24½	77/-
77. E. W. Hyndman, Miranda : Silver Wyandottes	102	70	97	93	104	92	60	70	61	60	44	45	898	24½	84/-
78. Wickham and Scarr, Roseville : Black Orpingtons	104	83	66	81	113	87	88	84	65	50	57	20	898	27	81/7
79. M. Ward, Gosford : Black Orpingtons ..	19	54	70	58	118	109	101	95	68	78	72	47	889	26	75/-
80. D. Darragh, Ashfield : White Leghorns	62	32	0	13	107	122	109	106	105	98	83	46	883	24	73/-
81. E. J. Turnbull, Mulgoa : Silver Wyandottes	29	37	44	83	116	111	99	85	70	66	85	55	880	24	73/9
82. W. H. Ponton, Tuggerah : Langshans ..	36	57	62	90	120	100	104	67	90	58	59	32	875	29½	73/9
83. A. P. Sargent, Fivedock : Brown Leghorns	34	69	66	76	102	116	118	97	76	55	50	14	873	23½	72/6
84. A. Creaser, Enfield : Buff Leghorns	16	55	27	53	123	127	118	86	89	91	48	36	869	25	80/7
85. V. J. Zahel, Marsfield : White Leghorns	32	6	0	50	105	123	121	127	115	107	69	14	869	23	65/5
86. J. Kelly, Gore Hill : Minorcas	21	13	28	41	70	107	129	92	96	110	79	68	854	26	70/1
87. W. T. Ely, Rydalmere : Black Orpingtons	23	48	50	115	125	134	99	66	83	50	40	13	846	30	67/2
88. Dorchester Farm, Campbelltown : Buff Leghorns	46	32	60	105	111	91	117	89	56	78	47	13	845	24½	70/-
89. J. Duncan, Ashfield : White Leghorns ..	8	40	76	73	134	136	100	72	52	59	35	56	841	29½	68/6
90. L. Allum, Summer Hill : Black Leghorns	5	27	47	77	129	96	105	102	79	70	55	39	830	29	64/6
91. W. Purdy, Rockdale : Houdans ..	0	1	17	50	126	125	132	108	86	83	63	34	824	26	61/6
92. H. Petersen, Port Kembla, White Leghorns	31	40	28	54	124	96	109	100	102	60	52	14	810	29	58/3
93. J. H. Beverley and Son, Marsfield : White Leghorns	43	86	49	28	71	89	103	88	80	80	61	28	806	26½	71/3
94. A. T. Pearse, Fairfield : Black Orpingtons	34	67	69	104	103	91	83	47	33	47	58	53	789	25	70/-
95. A. J. Laraghy, Singleton : Silver Wyandottes	74	89	48	70	106	95	77	67	44	46	39	31	786	26	71/1
96. E. Gauntlett, Galston : Buff Orpingtons	42	44	62	88	104	94	82	63	51	58	45	31	764	27	65/4
97. Miss M. Asser, Five Dock : White Wyandottes	88	63	35	58	128	107	71	73	31	59	54	44	761	23	64/2
98. W. R. G. Walsh, Arcadia : Faverolles	5	20	32	82	119	112	91	75	87	49	46	42	760	24½	59/-
99. Armidale Poultry Farm, Hurstville : White Wyandottes	15	31	3	51	111	105	92	80	82	51	64	68	753	25	60/9
100. J. S. Ong, St. Ives : Golden Wyandottes	13	60	50	64	103	80	69	65	66	53	39	59	721	24	62/2

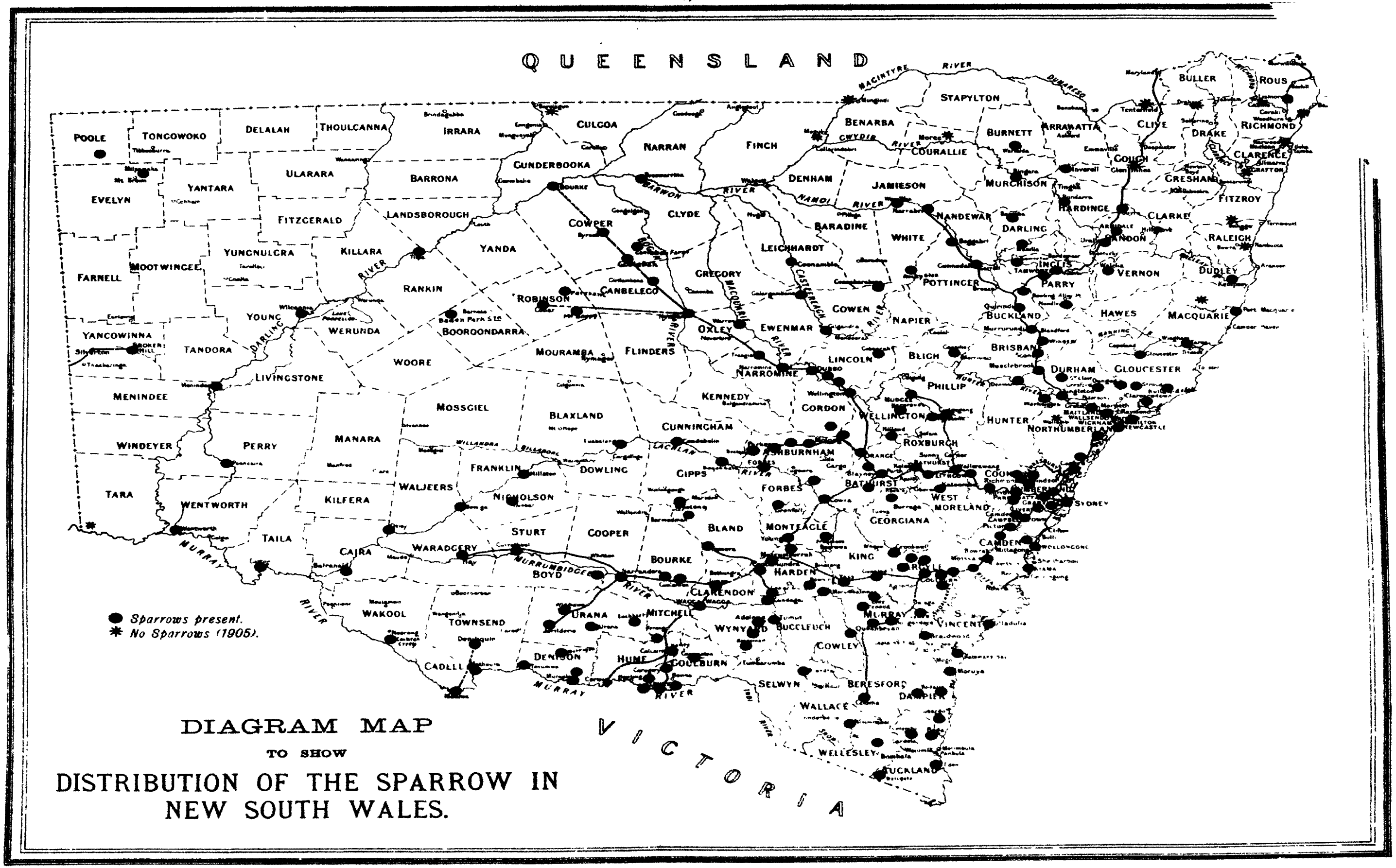


DIAGRAM MAP
TO SHOW
DISTRIBUTION OF THE SPARROW IN NEW SOUTH WALES.

98435

Photo-lithographed by W. A. Gullick, Government Printer, Sydney, N.S.W.

THE HOUSE SPARROW IN NEW SOUTH WALES.

[Condensed from a Special Report; the result of an Investigation into the Bird as a pest, carried out at the Hawkesbury Agricultural College, Richmond, New South Wales, 1905-1906.]

C. T. MUSSON

FOR some time prior to 1905 complaints were forthcoming from many districts as to damage the sparrow was doing. Inquiries, also, were frequent as to whether anything could be done to put an end to its depredations. During 1904 the Hawkesbury Agricultural Society took up the subject, organised and carried out a crusade against the bird, which is very plentiful in the district. The matter finally crystallised into an inquiry, interested persons being asked through circulars in this *Gazette* to furnish information. (*Agricultural Gazette*, xvi, 1905; Part 1, First Circular; Part 4, Second Circular.)

The investigation has been carried out in the intervals between other duties.

A short preliminary report was published (*Agricultural Gazette*, xvi, Part 4, p. 378) and a special note asking for replies from certain towns, of which a list was given (vol. xvi, Part 7, p. 702).

Nearly 400 correspondents were good enough to reply to the circulars, giving a considerable amount of valuable information, dealing with the bird from all aspects.

The general results of this investigation are given below in a condensed form. Much interesting matter relating to the life history of the bird, its introduction and spread, the means taken for its restriction, personal observations, and other details, must, unfortunately, be omitted.

The House Sparrow: Its introduction and spread.

(*Passer domesticus.*)

This bird, sometimes called the English sparrow, but more correctly the European house sparrow, is now widely distributed as a resident throughout the State. As it is still spreading, there can be little doubt but that another few years will see it attendant upon man wherever he has formed a settlement. Though essentially a town bird, it spreads over the cultivated areas in order to secure its chief form of food grain. Never breeding far away from man, it can be looked upon as a semi-domesticated parasite, making large use of the products of man's labour.

It is not at all remarkable that the position now taken here by the sparrow was foreseen by ornithologists, who were aware of its power of increase, pertinacity, and adaptability. Moreover, none of its natural enemies came with it. Can we wonder therefore, that in this mild climate, where space and plentiful food with other favourable circumstances, are provided for it with absence of unfavourable conditions, that the sparrow has spread and multiplied, to the great consternation of farmers and fruit-growers.

Yet the sparrow does a large amount of good; and whilst we may safely conclude that, from the individuals point of view the bird does much more harm than good, yet, in the economy of Nature, it must not be judged too harshly. At present the sparrow here is an increasing force, but Nature is stepping in and will have an important say in the matter, for no animal can go on increasing indefinitely beyond a certain point. Like other plagues, as of mice, rats, and fleas, increase goes on up to some maximum, which, however, we cannot indicate; then come disease, enemies, certain natural forces which cannot be denied, and the numbers of the pest will be reduced to a more or less elastic average, the organism taking its place finally as a permanent resident, with a definite place amongst the animal and plant residents, which cannot alter without calling down upon itself the active operation of the life laws which frame and keep in order what we know as the "balance in Nature."

We may confidently look for some such destiny as this to outline itself for the sparrow in Australia. The bird will spread until it has searched out every township, following the railway lines and roads as the natural trails—forced to spread by numerical increase, and a natural bird law that the young at maturity must leave the parental home and colonise for themselves. This law is forced on birds by the question of food supply. Having colonised every suitable spot, even in most cases making themselves at home at stations and isolated homesteads (carriers' waggons and the necessity for conveying stock food will, where roads are not well defined, be the guides leading these birds through bush and over plain), they will increase up to the maximum limit allowed by the operating laws.

Meantime enemies, in the shape of hawks, owls, butcher-birds, crows, are already at work, building up a taste for the sparrow's plump and somewhat oily body, so much beloved of cats. It takes time to fix a taste for a new food article in the predaceous birds, but it will grow.

The increase in numbers will bring with it, consequent mainly upon crowding, forms of disease, and the attack of parasites, which will help largely in bringing about reduction in numbers. Even the mosquito helps by causing some mortality amongst young birds. Moreover, population is increasing, and the hand of man is bearing more and more heavily upon these bird robbers.

As the outcome of these factors operating with increasing intensity, a time is coming—will come possibly within the next twenty years—when the sparrow will have found its level. It will always be with us, for extermination is impossible; but it will be in known quantity. Its depredations will be measurable—we shall no longer fear it as a growing evil—but by keeping up a regular and well defined attitude of hostility, carrying out certain approved methods for keeping them within bounds, the sparrow will be merely a circumstance in the yearly life of the farm or orchard, to be attended to as we attend to seeding and cultivation, pruning or manuring, with a minimum of cost in money and time, and a maximum of success attained, provided we really do carry out what has proved to be necessary and practicable, whilst fully giving the required results.

Introduction to New South Wales.

In the Report of the defunct Acclimatisation Society for 1863, mention is made of the introduction, amongst other things, of two sparrows. A correspondent sends the following :—

The English house sparrow was introduced into New South Wales by Mr. Young, a merchant, who resided on the Glebe Point Road about forty-five years ago. My authority for this statement is a debate which took place in the old Horticultural Society about forty years ago at which I was present. The sparrow (introduced in mistake for the hedge sparrow) had then been with us only a few years, and even then was much disliked for his predaceous proclivities by the gardening fraternity.—(C. ROBINSON, Woodlands, Gosford.)

They are believed to have been introduced into Victoria about the same time.

There seems to have been a craze for the importation of English birds into various countries during the fifties and sixties, for the United States received its first consignment about 1850 and others for the next ten years ; whilst New Zealand imported it about 1858.

From the time of its introduction down to the year 1890 the bird does not appear to have caused any apprehension as to the possibility of its becoming a serious pest, although numerous observers who knew it as a field and orchard pest in England, remarked, when they first saw it settling in their district, as they now report, that it would probably become in time as great a pest here as it is in its native home. It bids fair to become worse here than it could ever be in England, where population is denser and areas are smaller. These warnings, however, carried no weight.

It is impossible to say what has appeared respecting this bird in the daily and weekly papers between the time of its introduction in the early sixties and the year 1890, when, at the Conference of fruitgrowers, the sparrow was only mentioned twice, and then only by way of warning. Mr. W. H. McKeown, Roseville, Gordon, said :—

I have now to speak of another pest, which, although only in its infancy, is sufficient to cause alarm, viz., the sparrow. If it be not dealt with promptly I am afraid it will prove more serious than the flying-fox. In the grain and grape-growing districts it must become a difficulty only second to that of rabbits and hares. Each year will make it more difficult to cope with these birds, so rapidly are they increasing.

At the same Conference the late Dr. Norton said :—

The sparrow is mischievous, filling gutters of houses, destroying whole crops of millet and other grain, flower and vegetable seeds, and young plants, and often driving away some of our useful Australian birds. The bird it was intended to introduce was no doubt the useful hedge sparrow, but its impudent larrikin substitute is here and feels thoroughly at home. It is not likely to be got rid of, in spite of the efforts at extermination which have already been commenced in some places.

These seem to have been the first notes of warning in connection with the sparrow, and put the date of its first having shown signs of becoming a pest at some time before 1890. It is remarkable that the sparrow is not mentioned in the report of the proceedings of the Agricultural Conference held at the Hawkesbury College in July, 1897 ; nor can the writer remember the subject being mentioned during the three days over which it lasted ; nor was the sparrow mentioned at the Conference of Agricultural Societies' delegates held in Sydney in February, 1895. Mr. C. Robinson, of Gosford, writes :—

At Ashfield, where I had an orchard attached to a residence about thirty years ago, I found that the sparrows destroyed stone fruits and grapes. Absence of water, perhaps, gives a special zest to all ripe stone fruits, particularly grapes.

It was therefore damaging fruit about 1875 in the Sydney suburbs.

As to their breeding habits.

The number of broods may be any number up to six—usually three or four, with four to six young in a brood. The numbers vary considerably, but it would appear that a pair of sparrows will raise twelve to fifteen young each year. Breeding is continuous from August to February in the warm parts of the State. They breed in and about buildings and in trees close at hand. Very rarely are they found more than a quarter of a mile from habitations.

As to their driving away or molesting other birds.

The sparrow does drive away other birds, chiefly house swallows and fairy martins, often making use of their nests. In this, however, the result is not of importance to us, on account of the fact that swallows and martins live on insects that do not affect the agriculturist, being chiefly neutral species such as gnats. In other cases the driving away is probably usually a case of "hustling" to get at the food, or secure suitable roosting or nesting accommodation.

It is remarkable that observation points to the hustling habits of the sparrow as having a wide-spread effect. Doing away with the sparrow has certainly in some instances (England) resulted "in a decrease of insect pests, because the native insect-eating birds have been enabled to feed in peace, and have largely returned to their old haunts around farms, orchards, and gardens as a feeding ground, which they were not able to do when the sparrow had possession."

(*To be continued.*)

Notes on Western Timbers.

Mr. A. A. McVicar, Gumble, Molong, writes with reference to Notes on Western Timbers in the *Gazette* for April, 1907, as follows:—

"My experience of belah is, that it is of no practical use for fencing posts or outside work. Very old belah will stand well when split, but it is too difficult to work. The statement that 'young belah is good scrub-feed for sheep' is misleading. Young belah is too woody, and causes impaction of the stomach, and invariably death, if the sheep are at all weak. The older the belah the better for sheep-feeding, and if molasses and Epsom salts (magnesium sulphate) are given with it, ewes will lamb on it, and may be saved; but they will not give sufficient milk to save the lamb."

A full account, with illustrations, of the Belah will be found in Part 13 of Mr. Maiden's "Forest Flora of New South Wales," published by the Government Printer at a shilling.

The Eastern Plague Locust.

(*Oedaleus senegalensis*, Krauss.)

Some Suggestions how to Check them.

WALTER W. FROGGATT, F.L.S.
Government Entomologist.

Several well-defined species of plague locusts (popularly called "grass-hoppers") have been described from the southern and western parts of New South Wales; and when swarms have appeared in the coastal districts, they have been usually considered to be one or the other of the western species that had come in from "out west." From investigations carried out this season in the Singleton district, I have found that the swarms which have been devouring the grass and herbage for the last six months belong to a species that until now has never been recorded as a "plague locust." *Oedaleus senegalensis* was originally described by the German naturalist, Krauss, from Eastern Africa, from which fact it takes its specific name. It is common about the grassy flats on the Blue Mountains and along the coast north of Sydney, but may have a much more extended range. In general appearance it is not unlike a small form of the large yellow-winged locust (*Locusta danica*), but it has the basal portion of the wings tinged with very pale yellow. The black horse-shoe-like band towards the middle of the wing is broken and irregular; the tip is usually more or less black.

Among these locusts, however, there was a sprinkling of the larger plain locust (*Chortoicetes terminifera*), a more slender but slightly larger locust, with clear wings only clouded at the tips, but they comprised a very small percentage of the swarm.

It is most probable that this has often been the species that infests the eastern districts; but it has always been taken for granted that it was an invasion from the west, and the specimens have never been examined when they appeared in swarms.

The amount of grass and herbage these locust swarms devour in the course of their existence, which will range from four to six months and even sometimes longer if the season is favourable, is something enormous, for they are feeding all the time—as soon as they emerge from the egg until they die of old age, and during that time must assimilate many times their own weight in solid material.

When obtainable, they eat the best and tenderest grass; but are not particular in times of drought, for then they can assimilate anything, and I have seen them eat old sugar-mats on a station fence when swarming over the Murray in midsummer. They commence feeding in the early summer, and often eat off the young grass that the grazier especially wants for his stock at that time of the year, so that it is hard to estimate the money loss caused by the advent of a large locust swarm, but the total loss they cause annually in Australia must be something considerable.

It is not until the locusts have developed their wings and taken to flying round that we hear any complaints about them in the newspapers, or suggestions made as to the best methods to destroy them. Experiments carried out on an extensive scale some years ago in the Condobolin district proved that inoculation with African fungus could not be relied upon, unless under exceptional climatic conditions, which do not exist in our locust-infested districts. Even in South Africa, where for some time great results were claimed for the action of the fungus, the reports were very conflicting, and the latest reports to hand point to the fact that the settlers are going back to mechanical methods in dealing with the locusts.

The time to attack the locust swarms is not in the winged state, but in the egg state, or after the baby locusts have emerged, and are helpless tiny wingless creatures, congregated together in dense masses, and easy to get at.

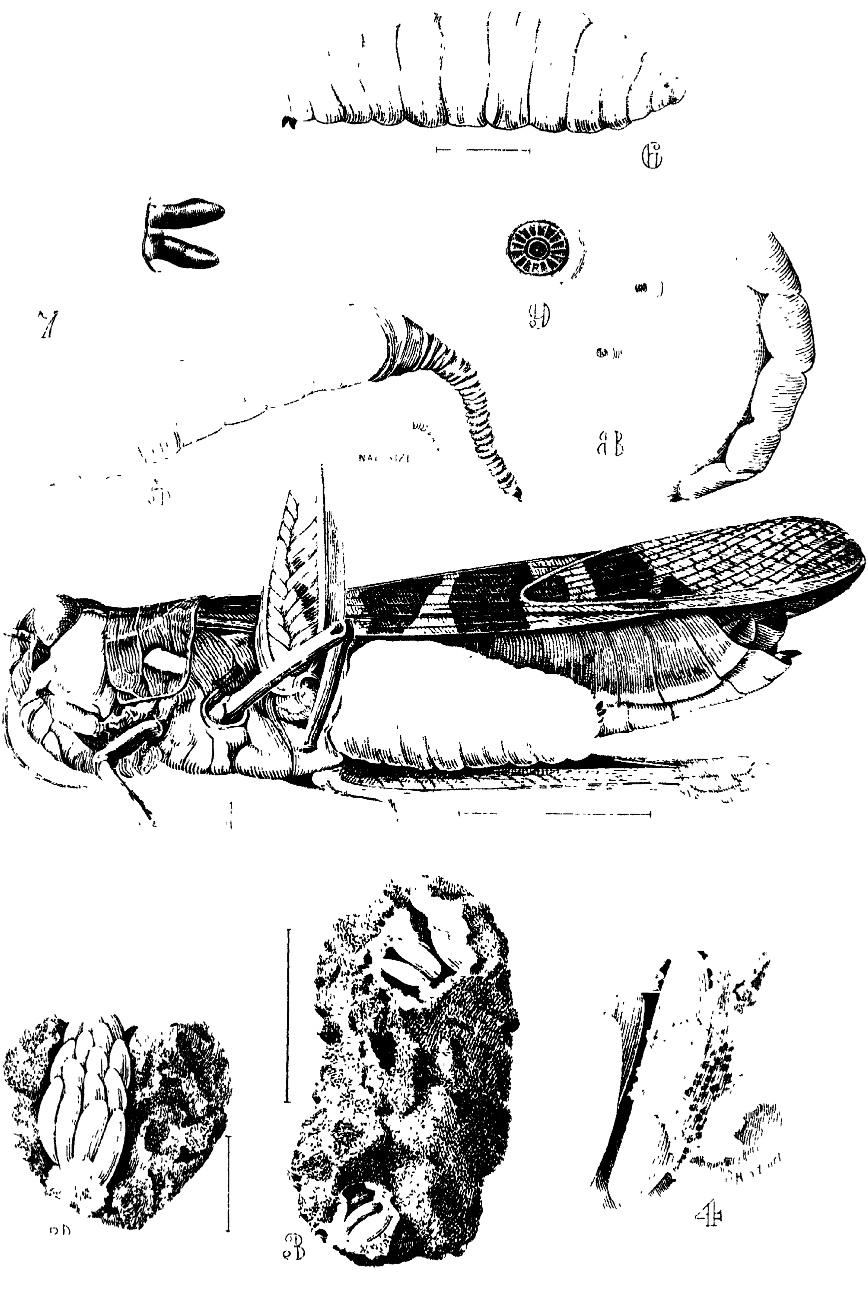
In other countries this was recognised many years ago, and in Southern Europe and Africa millions of eggs are systematically collected and destroyed, usually under Government supervision.

This season Mr. G. Freeman, Stock Inspector at Singleton, has located some extensive egg-beds of this locust close to the Wamba Homestead, about 16 miles from Singleton, and under his guidance I visited the district, and examined this nesting ground.

We found several hard open-grassed ridges (where on a previous occasion he had observed countless numbers of locusts in the act of laying their eggs) literally honeycombed with little circular pits containing from thirty to fifty eggs. These eggs measured nearly ¼ inch in length, were almost cylindrical, and rounded at the ends; they were enveloped in a brown frothy substance which matted them together when packed in a double row in the pit, and drying became a papery protective covering with a net-like structure, often imprinted on the outer brownish shell of the egg; this covering readily peels or breaks off, revealing the bright yellow tint of the inner integument. The female locust cuts these circular pits in the hard ground with the four horny plates at the tip of the abdomen, working them after the manner of an auger, the dust rising up in a little ridge round her extended body; the holes or pits are about 1¼ inches in depth, and though open when the locust has finished the business of egg-laying, are soon filled in and covered over with the fine dust all over the ground excavated by the egg-layers.

The remnant of the swarm that laid these eggs is still in the neighbourhood, and many of the females examined contained well-developed eggs, usually attached to the ovaries in a double row of four on either side, making sixteen in all; they did not appear to be going to deposit any more, and it is probable that the first frosts will kill them off before the eggs are ready to deposit.

There is no question that an immense number of these eggs could be exposed and left to the mercy of the many carnivorous insects, insectivorous birds, and the weather, by digging or ploughing very lightly, but I know how difficult it would be to get any landholder to damage good grass land to destroy locust eggs when they may not hatch for months, and *something* may turn up in that time to destroy them without his intervention. It would



EASTERN PLAGUE LOCUST

1. *Dead Locust (Oedaleus senegalensis), showing maggot emerging from abdomen*
2. *Locust eggs, showing the double rows in which they are placed in the hole*
3. *Earth, showing egg-mass in hole with eggs exposed*
4. *Showing egg much enlarged, and the lace-like structure of the enveloping matter in which they are deposited.*
5. *Maggot with the anal appendage covering the anal segments when the maggot is in the body of the Locust*
6. *Maggot adult, near the pupal stage*
7. *Mouth hooks of Maggot (larva)*
8. *Ventral view of anal segment (larva)*
9. *Spiracles on anal segment (enlarged)*

certainly pay him, but when such a suggestion as the destruction of the eggs is mentioned (like the orchardist in regard to the destruction of fallen fruit to clear out fruit fly), the squatter says, "What is the use of my destroying the eggs in my paddocks when the locusts bred in my neighbour's paddocks will come across and eat off my grass."

In a breeding-ground like the one we have examined, I believe that the least expensive method would be to attack the baby hoppers as soon as they have emerged from the ground, and are gathered together like a swarm of ants.

The method I suggest and propose to try with the permission of the owners this summer is to spray the baby hoppers at this stage with a mineral oil or kerosene emulsion; probably 1 in 20 or even less will be sufficient to kill every hopper it touches, and the expense would be very slight, as the sprayer could be placed on a cart and run over the infested area in a very short time. The advantage of an oil spray over the pasturage, instead of arsenic or other mineral poison, is that it will not damage the grass or leave any poison on the ground, as it is a contact poison, and kills by smothering the locusts.

Parasites of the Locusts.—At the invitation of Mr. Sylvester Browne I visited Minembah to examine the locusts in his paddocks, as he stated he had found a great number of dead specimens clinging to the grass and herbage, and on examination had found a parasitic maggot in the bodies of some of them.

On examination I failed to find any parasites in the bodies of the dead locusts; but we found that a very large percentage of the live ones each had a large dipterous maggot situated at the base of the thorax and abdomen. This maggot, rounded and obese in general shape, was furnished with a remarkable spiral tail fitting like a glove over the anal portion of the abdomen, and tapering off into a long slender corrugated structure, not unlike a rubber hose bound with wire. When the maggot was removed from the body of the locust, this tail process became detached.

The function of this curious appendage may be to protect the breathing spiracles on the anal segment of the maggot, but I can find no record of such a structure on any dipterous larva. These larvæ are under observation, and some should breed out; until then its identity cannot be determined.

Olliff discovered a dipterous parasite of the Southern Plague Locust (*C. terminifera*) in the Hay district, which he and Skuse described under the name of ***Masicera pachytyli***. A second species, *Sarcophaga aurifrons*, has been bred from locusts in the Queanbeyan and Cooma districts. This last-named fly is a very common and widely-distributed species, which is often found about pigsties and other evil-smelling places.

NOTE.—Mr. McAlpine, Government Pathologist, Victoria, has examined some of the dead locusts collected round Singleton, and informs me that my surmise was correct, and that they have all died from the fungus disease ***Empusa grylle***, Fres. This is a well-known destructive agent among the locusts in America. Lugger in his "Orthoptera of Minnesota" (*Bulletin*, No. 55), figures a dead locust clinging to the grass killed by this fungus.

Weather Conditions during April, 1907.

A. NOBLE,
Officer-in-Charge, Meteorological Department.

WITH the exception of a few showers on the north coast, fine weather prevailed until the evening of the 5th, when a monsoonal rainstorm set in and extended east and northward, causing more or less general rainfall over the State on the 6th and 7th. The distribution was, however, very erratic, due to its association with thunderstorms. Many stations received no rainfall while adjacent ones received heavy falls. On the 8th, practically the whole of Australia was covered by an area of "high" pressure, while to the south-east of the continent there was an energetic "low" operating. Cold, squally westerly winds throughout New South Wales was the result of these two systems for two or three days. On the 15th, some low temperatures were recorded, chiefly over southern districts, the lowest being at Kiandra 23°, and Nimitybelle 31°. On the two following days light to heavy rainfall was recorded over the Barwon triburaries, highlands, and coast districts extending as far north as Port Macquarie. The distribution was again irregular, due to thunderstorms. On the 18th, an energetic low pressure appeared to the south-west of Victoria. This disturbance resulted in light to moderate rainfall throughout southern districts during the three days which it took to reach our coast line. It practically remained stationary until the 24th when it intensified considerably, resulting in strong and cold west to south-west winds on our coast, and gales with rough to high seas in Bass Straits. On the 23rd, some very low temperatures and frosts were recorded on the northern high-lands, the frosts extending as far north as Grafton and Tabulam. The following were some of the lowest records:—Warialda 21°, Inverell 24°, Glen Innes 25°, Coonabarabran 26°, Armidale 26°, and Walcha 28°. On the 27th, a new disturbance appeared in the Bight, and as it advanced eastwards resulted in moderately light temperatures in our State during the 28th and 29th, and high to moderate rainfall associated with thunderstorms was recorded throughout, the falls ranging from a few points to ¾ of an inch. On the extreme north coast, however, the rain was much heavier, 310 points being reported from Tweed Heads.

The following statement shows briefly a comparison of the chief meteorological elements over India, together with Australia, as far as data are available, for the month of April, 1907:—

	Departure from normal.		General Conditions (referring to State as a whole).
	Pressure.	Temperature.	
	Inch.	°	
India	+ ·03	− 2·8	Wet.
Sydney	− ·07	− 0·1	Moderately dry.
Melbourne	− ·12	− 2·0	Moderately wet over northern half; wet over southern.
Perth (W.A.) ...	+ ·04	+ 1·1	Rainfall below normal, especially over goldfields and in tropics.

Taking our State as a whole during the month of April, the weather may be characterised as moderately dry. The rainfall was above average at only a few stations on the Upper Barwon tributaries, Central and Southern highlands, and coastal parts between Jervis Bay and Moruya. Most stations show a considerable defect, ranging from 50 to nearly 100 per cent. below normal, while no rain fell at several stations in the far north-west and lower Barwon tributaries.

The distribution over the several sub-divisions appears as follows :—

	Percentages. Above.		Below.
North Coast	—	...	39 to 84
Hunter and Manning	21	to	96
Metropolitan	—	..	29 to 72
South Coast...	23	to	81
Northern Tableland	—	...	2 to 82
Central Tableland ...	—	...	6 to 87
Southern Tableland	71	to	75
North-western Slope	50	,,	73
Central-western Slope	—	...	18 to 52
South-western Slope	12	to	88
North-western Plain	70	,,	78
Central-western Plain	—	...	1 to 100
Riverina	—	...	24 to 94
Western Division ...	14	to	100

Hawkesbury Agricultural College.

MONTHLY WEATHER REPORT.

Summary for April, 1907.

Air Pressure (Barometer).			Shade Temperature.				Air Moisture Saturation=100.			Evaporation (from Water Surface).			
Lowest.	Highest.	Mean.	Lowest.	Highest.	Mean.	Mean for 15 years.	Lowest.	Highest.	Mean.	Most in a Day.	Total for Month.	Monthly Mean for 9 years.	% of the year's Evaporation.
29·61 20th.	30·46 3rd	30·05	38 27th.	86·8 2nd.	62 29	63·24	43 22nd.	100 11th.	74·7	·187 10th.	3·576	3·177	7

Rainfall... Points .. 10 3 1 94 39 1 31 = 179.
Dates . 8 14 15 16 17 22 30

Mean Rainfall for 15 years = 241.

Wind ... N 8, NE 8, E 1, S 3, SW 2, W 6, NW 4

Thunderstorms on 15th, 16th, 29th.

Greatest daily range of temperature, 40·9° on 28th.

Days on which temperature fell below 42° $\frac{38·1}{26}$ $\frac{38·0}{27}$ $\frac{40·1}{28}$ $\frac{40·9}{30}$

W. MERVYN CARNE,
Observer.

English Market Quotations.

In a commercial newspaper—*The Public Ledger*—which is published in London, it gave market quotations for certain articles imported into Britain.

As there is an impression in various quarters that something can be done in different parts of Australia in the growing of cotton, fibre, India rubber, jute, oil-producing plants, and tobacco, these market quotations showing the values will be of interest to speculators and farmers who may have an idea of attempting the cultivation of such crops in the more or less tropical parts of this or other States :—

SEMI-WEEKLY PRICE CURRENT.

Bank Rate of Discount 5%
" " 1906. .. .. 4%

Articles in the following list subject to duty are quoted with the duties paid as annexed, unless marked "in bond." Those articles against which no rate of duty is placed are admitted free :—

Articles.	Prices. 15 March, 1907.					
Cotton, per lb.	s.	d.		s.	d.	
Surat : Broach ..	0	$5\frac{1}{4}$ @		0	$5\frac{9}{16}$	
Sawginned Dharwar	0	$4\frac{13}{32}$		0	$4\frac{17}{32}$	
Madras : Tinnevelly	0	$5\frac{1}{16}$		0	$5\frac{3}{8}$	
Western	0	$4\frac{13}{16}$		...		
Coconada	0	$4\frac{5}{8}$		0	$4\frac{7}{8}$	
Salem	0	$4\frac{7}{8}$		..		
Bengal	0	$3\frac{5}{16}$		0	$3\frac{31}{32}$	
Scinde	0	$3\frac{17}{32}$		0	$3\frac{31}{32}$	
Australian	0	$6\frac{3}{8}$		0	$6\frac{7}{8}$	
Tahiti and Fiji ...	...			...		
American : Sea Island	0	$9\frac{1}{2}$		1	8	
West India	0	$6\frac{1}{2}$		0	$7\frac{3}{4}$	
Fibre :—	£	s.	d.	£	s.	d.
Algra, Orld, grs. . .	5	0	0	6	0	0
black	9	0	0	...		
Aloe	8	0	0	31	0	0
China, grass ...	34	0	0	40	0	0
China, jute	20	0	0	21	0	0
Mexican	21	0	0	30	0	0
Raffia	30	0	0	30	0	0
Rhea or Ramie . .	...			..		
Palmyra	10	0	0	33	0	0
Kitool, lb.	0	0	1	0	0	9
Hemp, per ton, c.f.i. :—	£	s.		£	s.	
St. Petersburg, clean	..			...		
Polish	32	10		35	10	
Italian, p.c. ...	43	10		44	10	
Sunn...	12	10		33	10	
Other East India ...	12	0		35	0	
Manilla, brown, &c.	37	0		37	0	
fair ..	40	0		41	0	
good ...	43	0		45	0	
Quilot ...	50	0		65	0	
Mauritius	26	0		33	0	
New Zealand ...	34	0		36	10	
Sisal	18	0		34	10	

Articles.	Prices. 15 March, 1907.					
India rubber, per lb. :—	s.	d.		s.	d.	
Para, fine	5	1 @		.		
Negrohead .. .	3	0		4	$0\frac{1}{4}$	
Columbian ...	2	9		4	2	
Central American ...	2	9		4	$3\frac{1}{4}$	
Mattagrosso .	3	10		4	$7\frac{1}{4}$	
Madagascar. ...	1	7		4	3	
Mozambique ..	2	3		4	7	
Assam and Rangoon	1	9		4	0	
Borneo	1	$7\frac{1}{2}$		2	8	
Penang, Java, &c....	2	2		4	4	
Plants, sheet and bscts.	5	$7\frac{3}{4}$		5	$8\frac{1}{4}$	
Crepe	5	1		5	$10\frac{1}{2}$	
Scrap	3	$9\frac{1}{2}$		4	8	
Jute, per ton, c.f.i. :—	£	s.		£	s.	
Good to fine ...	23	0		32	0	
Medium	20	0		22	0	
Common	18	0		19	10	
Oils, per tun :—	£	s.	d.	£	s.	d.
Olive : Spanish . .	...			...		
Levant	44	0	0	..		
Cocoanut : Cochin...	46	10	0	...		
Ceylon	42	0	0	...		
Mauritius	...			...		
Copra	39	0	0	40	0	0
Ground-nut... ...	25	0	0	45	0	0
Palm, Lagos ...	35	10	0	.		
Palm-nut kernel ..	38	0	0	...		
Linseed	22	15	0	22	17	6
Rape-seed, pale ...	32	15	0	...		
brown ...	30	0	0	...		
Cotton-seed, refined	26	10	0	28	0	0
Rice, per cwt. :—	s.	d.		s.	d.	
Rangoon	8	$1\frac{1}{2}$		8	3	
Bassein	8	3		8	$4\frac{1}{2}$	

Tobacco, per lb. :—Duties : Manufactured, viz., Cavendish or Negrohead, 4s. 4d. ; do, manufactured, in bond, 3s. 10d. ; other manufactured tobacco, viz., cigarettes, 4s. 10d. ; other sorts, 3s. 10d. ; unmanufactured, if stripped or stemmed, containing 10 per cent. or more moisture, 3s. 0½d. ; containing less than 10 per cent., 3s. 4½d. ; unmanufactured, if unstripped or unstemmed, containing 10 per cent. or more moisture, 3s. ; containing less than 10 per cent., 3s. 4d.

	s.	d.		s.	d.
American, Virginia :—					
Leaf : Bright order to fine	0	5½	@	1	2
Strips ,, ,,	0	7		1	4
Dark order to fine ...	0	4½		0	7½
Strips, dark order to fine	0	6		0	9
Kentucky ,, ,,	0	4½		0	7½
,, strips ...	0	6		0	8½
Maryland and Ohio	0	6		0	11
Borneo and Sumatra ...	0	9		5	6
China	0	4½		0	6½
Columbian	0	3½		0	6
Cuba and Yara	0	10		2	0
Dutch	0	4		0	6
German . .	0	7		0	11

	s	d.		s.	d.
Greek	0	3½	@	0	5
Havana	1	0		2	6
Japan	0	3		0	9
Java	0	4		2	0
Latakia	0	5		1	3
Manilla	0	6		2	0
Mexican...	1	0		4	6
Paraguay	0	4		0	5
Samsoun and Trebznde	0	4		0	7½
Turkey, Cavalia ...	0	7		1	0
,, for cigarettes ..	0	7		4	0
Manufactured, Cavendish	0	3		1	0

Market for Agricultural Produce.

The following extracts from a letter from an importing firm in England, who are desirous of opening up a trade in the commodities mentioned, has been handed to the Director of Agriculture for publication. For further particulars, application should be made to the Director of Agriculture, Sydney. The prices mentioned are all average prices :—

Sunflower Seed.—This seed is obtainable in Russia in three qualities—black, white, and grey. Prices vary from £7 to £11 per ton, c.i.f.

Pumpkin Seed.—This we buy principally from Roumania, Russia, and Hungary. Average price, about £10 per ton, c.i.f.

Maple Peas, &c.—We can place all kinds of blue and white peas, also so-called Maple Peas, if you can offer any. Prices vary very much according to quality ; still, white feeding peas are always worth about £6 per ton, c.i.f.

Barley.—We send you a sample of Chilian Chevallier Barley, ex Galicia. This is worth, in ordinary years, about £7 per ton, c.i.f., London. Further Chilian brewing barley, "Ruyter," is worth, in ordinary years, about £6 per ton, c.i.f. You grow some very good barley in your country, and would like to have some samples from you.

Oats.—Prices vary very much according to quality, and in order to do business we require samples.

Horse Beans.—Standard value, about £5 10s. to £6 per ton.

Ants' Eggs.—We do not know whether you can collect this article. From Russia we buy at 50s. per cwt., c.i.f.

Oil Seeds.—We are further interested in all kinds of oil seeds. Castor seed, of which we send you sample, would be worth £10 per ton, c.i.f., London. You will find this grows wild in Australia, and perhaps you can arrange for the collection. The price this year, we must say, is exceedingly high. Usually this seed is only worth £7 per ton.

Linseed.—This is worth £9 per ton, c.i.f.

Canary Seed.—Screened plate, as per sample, is worth £8 10s. per ton gross weight, including bags, f.o.b., London.

Orchard Notes.

W. J. ALLEN.

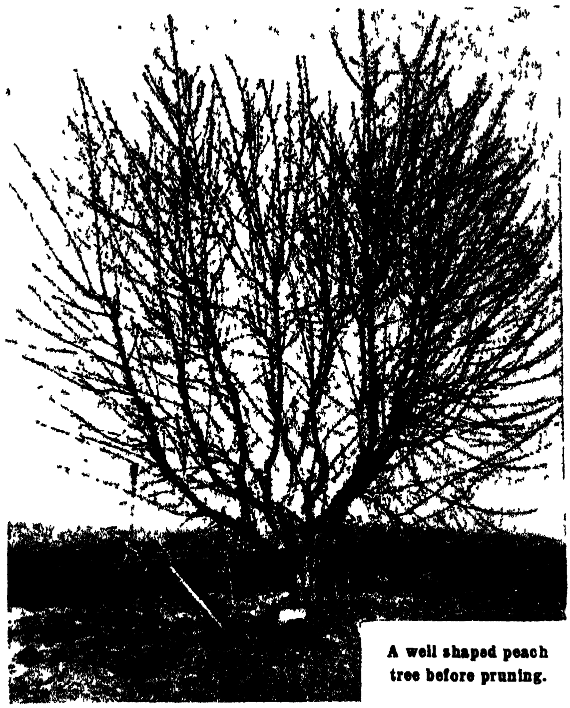
JUNE.

Fruit Fly.—The prevalence of this pest has this year been so widespread and destructive that growers have been at their wit's ends to know how to cope with it, and for the past few months a good many have been experimenting with the kerosene remedy for its destruction, and in nearly every instance a fair measure of success has followed their efforts. The method of procedure is to get shallow tins (any shape will do), the most suitable size being from 5 to 6 inches square, which can be purchased at about 14s. per gross with the covers to keep out the rain. These are hung in the trees in numbers of one to four, according to the size of the tree, and contain kerosene to about a quarter of an inch in depth, or perhaps not quite so much would be sufficient. The fly is attracted by the kerosene, and is caught in quantities in this way, being found drowned in the tins. I have caught them in this way several days after all fruit, infested or otherwise, had been removed. The hanging of several tins in every tree in either small or large orchards would entail considerable work and expense in providing tins and kerosene, as it is necessary to go over them about twice a week to refill the tins with fresh supplies of kerosene, as the oil after being exposed for a few days seems to lose its attraction for the flies. If, however, by spending from 6d. to 1s. per tree we can reduce this pest to any appreciable extent, and save the greater part of the fruit, it would pay all growers to make a combined fight in order to wipe out, if possible, this latest and most troublesome enemy. All growers are now compelled to pick up and destroy all infested apples found in their orchards—the word orchard, under the Fruit Pests Act, embracing all grounds where there are found one or more fruit-trees.

Pruning.—This is a good month to push on the pruning of deciduous trees, in order that this work may be completed in good time so as to enable the spraying to be finished before the buds are too far advanced. During the first few years after the trees are planted see that they are given a heavy pruning, removing the central branches so as to leave the centre of the tree quite open, in order that the middle as well as the outside, and the bottom as well as the top, have plenty of room and light to develop good fruiting wood in every portion of the tree. If this system of pruning is followed the weight of fruit when the tree begins bearing is borne by strong, sturdy branches, which will not swing and bend with every breeze that blows.

Bearing Wood.—Good fruit develops on good-bearing wood, and good-bearing wood is the product of proper degrees of light and heat as has just been urged; but bearing-wood in the case of some fruits is new wood, and

reduction of old wood for the purpose of forcing the growth of new wood must be constantly in mind. Renewal is more or less a consideration with all trees, and especially the securing of strong new wood. This is a point upon which close study of the bearing tree will yield most satisfactory suggestions.



A well shaped peach tree before pruning.

Pruning to Obtain a Low Head.—It is as well to begin with the tree from the very start, which is at the time when it is transplanted from the nursery to the orchard, as a good beginning is half the battle. Assuming that a tree is about to be planted out, the first thing to do is to examine the roots carefully to ascertain how they have fared in their removal from the nursery, as in this country where proper tree lifters or diggers are seldom used it is frequently found that the roots have been badly mutilated. Before planting, all roots which have been broken or damaged should be cut away, and all the young roots cut back to within 6 or 8 inches of the tap root. All small roots may be removed, leaving only the larger ones, as by digging up a tree which has been planted for some time it will be found, except in very rare cases, that the very small roots never throw out any young rootlets, but wither away and die, becoming a hiding place perhaps, for White ants, which often in time, through such medium, take possession of the tree and cause its ultimate death. The roots should be cut with a sharp knife and in such manner that

The same tree pruned.

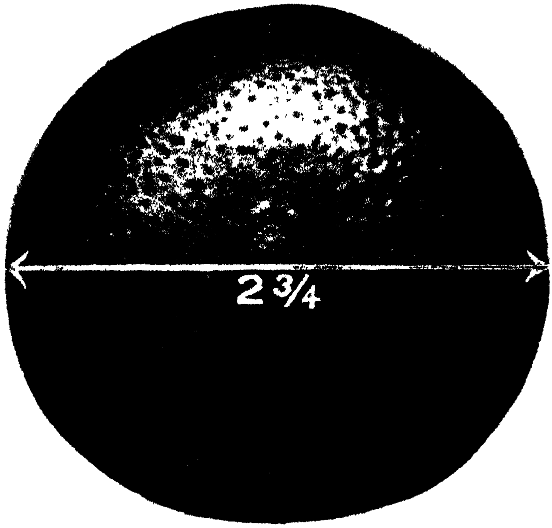
Pear tree before pruning.

when the tree is planted, the cut will face downward. By cutting this way, new roots which will form or rather grow from the cut, will have a tendency to grow in the required direction—downward. The next step to consider is as to how the top of the tree shall be dealt with. This of course will depend largely on the age of the tree in question. If a 2 or 3 year old nursery tree, it may be advisable to leave either three or four short arms, as it is found that if the head is cut away and only a straight trunk left, the top of the tree may not shoot, but will die, and the tree shoot from the root. This is often the case with the peach, but where a few shoots are left this danger is avoided. If a well grown yearling tree, I would prefer cutting it back to a single stem. It must be borne in mind always that in moving a tree it loses the greater portion of its roots, and that in consequence the remaining roots are unable to sufficiently support or nourish the growth above ground, for which the whole root system was intended.

We must therefore shorten the top in such a way as to re-establish the lost equilibrium, and the planter must bear in mind that it is always better to cut a newly planted tree back rather severely than to leave it with too much top, as by so doing it will recover more quickly, and in the end make a much better tree.

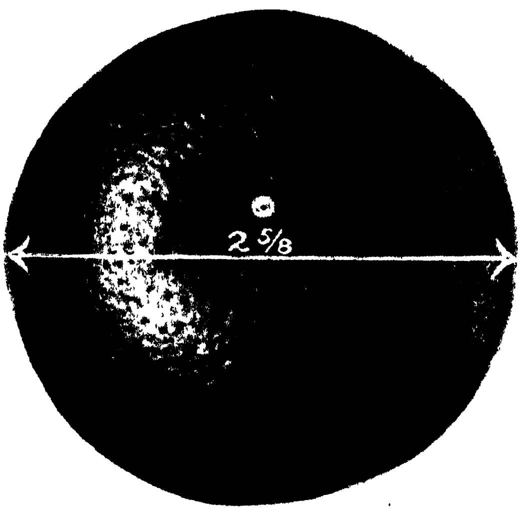
Citrus Fruits.—If it is intended to export any of these fruits to either London, Germany, or America, this season, this would be a good month to send some of it away. The Canadian market should take some of our fruit. The United States is also a good market, but fruit must be absolutely clean, otherwise it will be condemned. Seattle, Tacoma and Portland are three good sized cities which would take a lot of fruit and which are easily reached by the Canadian line of mail steamers. Some of our coarser skinned oranges stand exporting even better than the finer skinned fruit. The best sized orange is from $2\frac{5}{8}$ inches to

The same tree after pruning.



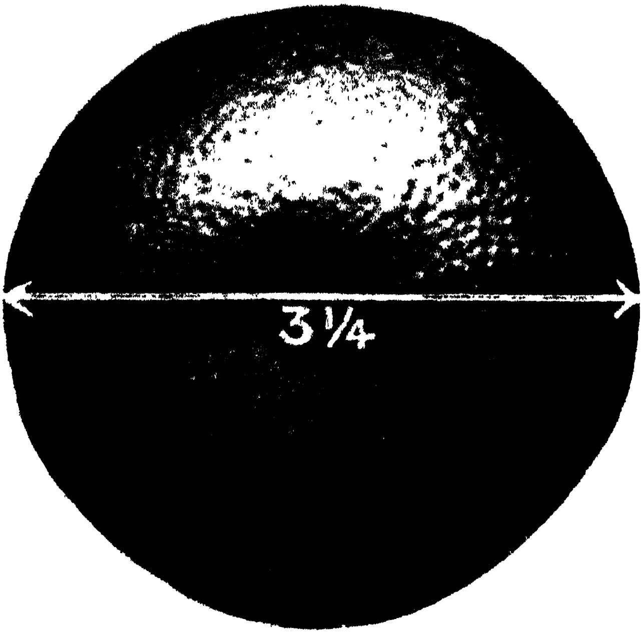
The best average size suitable for export.

$3\frac{1}{4}$ inches in diameter. Nothing larger than that should be sent and nothing smaller than $2\frac{5}{8}$ inches. Those who intend exporting should see that the fruit is in first-class condition when it is picked, that it is well coloured, free from blemishes, scale, or fungus diseases. It should be clipped and not pulled from the tree, handled so as to avoid bruising, and should never be picked during wet weather nor immediately after a very wet spell, but allowed to hang for two or three days after such, if possible. It should then be left in an exposed, well ventilated place for two or three days, to permit of the escape from the rind before packing, of some of the surplus moisture. After this the fruit should be graded evenly, wrapped in nice wrapping-paper, and packed evenly and securely in strong, good-looking, new cases. Always avoid walking over or stepping on any packed cases of fruit, as it is more than likely that some of the fruit will be bruised wherever stepped on; and how often have we noticed carters walk on packed cases of fruit in carts, &c., while loading and unloading, and stacking up packed fruit. It is well to put a little wood wool, or waste paper, in the tops and bottoms of the cases before and after packing, so as to minimise the chances of the fruit being bruised while pressing same and nailing on the covers. Each



Minimum size suitable for export.

case must then be stencilled, either with the number of pounds it contains, or that it contains a bushel of sound fruit. It is just as well to give the number of oranges in each case if the fruit is to be sent to Canada or the



Maximum size suitable for export.

United States, as it is the custom there to have the number in each case plainly marked on the outside. The import duties into Canada and the United States are as follow :—

	Canada	United States.
Apples	40 cents per barrel ...	25 cents per bushel.
Oranges and Lemons ...	Free	1 cent per pound.
Grapes	2 cents per pound ...	20 cents per cubic foot.

Sugar Prune.—This variety is said, by some growers in California, to crop every alternate year, and then heavily. If thinned, it attains a fair size, but lacks flavour—in fact, some claim that the Prune d'Agen is far superior to it. While I was in the San Josè district I did not see any of this variety being harvested, nor did I see any in the packing houses, and I therefore concluded that the varieties they were growing in quantities were the best they had—the French and Imperial. A good many young trees of this variety have been planted throughout the prune-growing districts of California, Oregon and Washington territory, and we wait with interest to see if they will hold their own with the older varieties—French and Imperial.

Planting.—In our dryer districts, such as Hay, Wentworth, Bourke, &c., where fruits are grown under irrigation, and where considerable ground is being planted with currants, sultanas, and raisin grapes, the land should be subsoiled as early as possible. Heavy clay soil should be avoided, as by planting such soils to fruit trees or vines nothing but failure can be expected. Therefore keep to the clay loam, or loamy soils, where the above fruits usually do best. Have the land in readiness, so that it may be planted in July, if possible, or not later than the beginning of August, in order to give the trees or vines a good early start in the spring.

Refills in all deciduous orchards should be planted this month.

It is not imperative that cultivation should be carried on in the orchard this month.

The Department of Agriculture's shipment of apples from the Bathurst orchard landed in London in good condition, and sold from 9s. to 14s. per case.

Seasonable Notes.

GEO. L. SUTTON, Wheat Experimentalist.

The dry spell which commenced in April and which has continued until the present time (May 18) has hampered the operations connected with wheat growing, and has curtailed the area to be planted. In the districts affected—the Riverina, the Central Tableland, the Southern and Western Slopes—planting has practically been suspended until rain comes, and in some cases the early-sown crops will have to be resown. It is extremely unlikely that the present dry conditions will continue for any length of time. When rain comes planting will require to be pushed on with all speed and continued later than is customary. For late planting preference, where such is possible, should be given to early maturing varieties, as Bunyip, Federation, Comeback, Bobs, Firbank, Steinwedel, and Gluyas' Early, or Wilkinson's Early Prolific, which may be planted as late as the end of June with every prospect of producing profitable returns. Last season at the Cowra Experimental Farm a 5-acre plot of Federation, planted during the first week in July, yielded forty-five bags, or at the rate of 36 bushels per acre, a result to some extent due to the peculiarities of the season which was favourable to late-sown crops, but a case like this illustrates the possibilities of an early variety when planted late in well prepared soil.

A regretable feature of the present short drought is the loss occurring through the inability of ewes to suckle their lambs, because of the scarcity of natural, and especially of succulent, feed. In order to reduce this loss recourse is being had to hand feeding. For this purpose, on account of their cheapness combined with their succulence, potatoes are being largely used. The fact that these are being purchased shows the necessity of providing succulent feed for such occasions. It seems, therefore, a very opportune time to draw attention to the advantage of conserving green fodder in the form of ensilage to

provide the succulence required. Potatoes are being purchased at 30s. to £2 per ton. A few months ago their equivalent in food value could have been stored in the form of ensilage by the majority of those now purchasing them at a cost of from 3s. to 7s. per ton. The saving which would have been effected had this been done should appeal to the business side of the sheep owner

As far as the wheat grower is concerned the situation will be largely relieved if rain falls by the first week in June, but the season is now too far advanced for rain to make much improvement in the natural pastures. To help out these until spring the farmer cannot do better than plant an area of rape, which is one of the quickest growing crops we have and for which June is quite a seasonable time to sow. Stock can be turned on to this crop as soon as there is enough for them to obtain a bite, and it will continue to grow until injured by the aphides in late spring. Three to six pounds of seed per acre should be sown either in drills or broadcasted. As this plant belongs to the turnip family an application of 40 to 50 lb. of superphosphate per acre with the seed is advisable. Such an application hastens the growth of the young plant and proves exceedingly profitable.

Caution.

FARMERS who use seed drills should note that seed treated with bluestone, bluestone and limewater, and bluestone and air-slaked lime, is not as "lively" and, in consequence, does not run as freely as untreated seed. The relative "liveliness" of treated seed is in the order given. With some seed drills, because of the smallness of the opening through which the grain is carried from the seed chamber to the delivery tube, a large quantity of treated seed is bruised or broken. The injury is greater with large long seeds than with small "shotty" grains, and also when seed not thoroughly dry is used. Farmers before starting to sow should carefully examine the manner in which the drill is delivering the seed. If the grain is being injured, the trouble can be remedied by enlarging the opening in the seed chamber, or by sowing the treated wheat down the division set apart for sowing oats. If the latter method is adopted the distributing gear will require to be set in accordance with the amount of seed it is found, by trial, that the drill sows.

FARMERS' FOWLS.

THE series of articles that appeared in the *Gazette* during 1905 and 1906 under the above title, contributed by Mr. George Bradshaw, has been published in book form ; it may be obtained from the Government Printer, or any bookseller—price, 1s. 6d, or by post, 1s. 10d. The book consists of 164 pages of useful poultry matter copiously illustrated, including eight full-page drawings of typical varieties.

Practical Vegetable and Flower Growing.

W. S. CAMPBELL.

DIRECTIONS FOR THE MONTH OF JUNE.

Vegetables.

AT time of writing the weather is quite spring-like, and where the rainfall has been good, the growth of vegetables and flowers has been all that can be desired, and there seems to be every prospect of equally satisfactory conditions continuing during the month of June. Unfortunately, large tracts of country have suffered from very dry weather for some time, so much so, that the growing of garden crops has been attended with many difficulties. The very best aid to the growing of plants under such conditions is farm-yard manure in abundance, deep digging, frequently trenching, and frequent cultivation. Then with the assistance of but little water, applied occasionally, vegetables may be grown, even under quite dry conditions. There is no theory about this for it has been done repeatedly. Remember that there should be no half-hearted measures taken. Carry out things properly, with a little determination to succeed, and then all should go well. Where farm-yard manure or dung is scarce, collect bush sweepings, leaves, dry grass, and so on, and keep quantities of this in reserve, decomposing, which it will do by degrees, even in a dry climate.

Globe Artichoke.—May be planted during the month or later still, or during the spring if more convenient. It is a large-growing, cumbersome vegetable. A single plant, if well grown on rich soil, will provide a fairly good supply of the flower buds, which should be gathered before they expand, and are then boiled and eaten with melted butter. Either suckers or rooted plants may be set out, the rooted plants being the most reliable.

Artichoke, Jerusalem.—This is altogether a different thing from the above; a kind of sunflower, the roots or tubers of which are used like potatoes. This is prolific and capital vegetable which, if grown largely, will be found most useful for pigs, who will perform all necessary harvesting for themselves if allowed access to the plants. In soils suitable, the weight of crop is sometimes enormous. The tubers are ready now for the digging, and may be taken up as required. Retain sufficient tubers for planting out in the spring.

Broad Beans.—This time of year is very suitable for the sowing of the broad bean. The seedlings from sowings made last month should be growing satisfactorily if they have been kept free from weeds and occasionally hoed. A short row planted once a week or once a fortnight should be sufficient of this vegetable. Plant the seed in rows from 3 to 4 feet apart, and about 6 to 8 inches apart in the rows. Cover the seed about 3 or 4 inches deep.

The old Windsor bean is a good variety for general purposes. The dwarf varieties are good, and may be planted much closer than the late-growing kinds.

Cabbage.—There should always be a few seedlings just ready for planting out, or pricking out as they may be required, and this can be arranged by sowing a very little seed, say, twice a month, and pricking out the little seedlings when they are ready, about twice every month also. When the pricked-out plants are ready to shift they can be moved as required, and, if abundance of manure is used on the ground prepared for them, they should grow rapidly. If you desire good cabbages, be not sparing of good manure, not rank and fresh, but well-rotted dung, and then the cabbages will be tender and sweet and good, especially if the soil between them be frequently hoed.

Endive.—This lettuce-like salad plant is useful for winter use, and is much appreciated by some persons for its peculiar, bitter flavour. A little seed may be sown occasionally, and young endives planted on well-manured soil.

Carrot.—Sow seed of some of the small varieties of this vegetable, for they are likely to succeed the best at the present time. Where cabbages have been growing would be a very suitable place for some carrots, for the soil should be in just the condition for a satisfactory crop of them.

Cauliflower and Broccoli.—These vegetables resemble one another so much that they are frequently both termed cauliflower. The method of culture is practically the same for both, and they may very well be bracketed together. Plant out a few young plants in good rich soil, and be careful in the moving, for any check to the growth, such as breaking many roots, is not advisable. Keep these plants growing all the time, from seed to hearting. Early planted cauliflowers and broccoli should be available for use.

Leek.—Sow a little seed now and then during the month and plant out a few young leeks occasionally. Use abundance of manure when preparing the ground, and use plenty of water should the weather be dry.

Lettuce.—A little seed should be sown occasionally and seedlings planted out from time to time as required. Move them carefully and use abundance of well-rotted, not rank, manure.

Onion.—If a sufficiency of plants have not already been raised, some more seed may be sown any time during the month. Keep the young onions well weeded and thin out all that are growing too close together.

Parsnips.—A small quantity of seed may be sown. Well-grown seedlings should be thinned out as they become crowded.

Peas.—Sow about twice during the month as extensively as may be required. Provide supports of some kind—sticks, brushwood, or wire-netting—for the young peas to climb up. Sow the seed about 4 inches apart in rows, and about 3 inches deep. The drills or rows formed may be 2 to 4 feet or more apart according to the height the peas are likely to grow, for some are dwarf, others of medium height, and others, again, grow tall.

Radish.—Sow a little seed two or three times during the month.

Herbs.—Plant out good young plants, or take up old stools, divide them and plant the best in good fresh soil.

Flowers.

New gardens can be made, and old gardens remade, if necessary, or increased, and many alterations effected at this time of year, but a good deal of care will be necessary when digging about the garden to avoid injuring dormant bulbs, or bulbs which are just making growth below the surface, and there are many kinds now which are just starting to grow.

When making alterations, or when digging and tidying up the flower garden, apply a good deal of well-rotted dung, and mix it in with the soil. All kinds of plants which have cast their leaves may be planted at any time convenient, but before planting examine the roots and remove any that are broken or bruised, using a sharp knife for the purpose. Such plants as carnations, columbines, snapdragons, violets, polyanthus, cowslips, daisies, perennial marguerites, campanulas, foxgloves, pinks, Sweet Williams, delphiniums for gardens in cool climate, stocks, wallflowers, dianthus of varieties, Marguerite carnations, everlasting peas, perennial phlox, statice, Japanese anemone, gaillardia, roses, and others may be planted, as well as any hardy annuals which are ready for putting out.

Roses may be planted whenever desired, and as probably everyone with a garden likes and appreciates the rose, probably new varieties will be required. Old roses may be taken up and planted in new places if considered necessary, and the present is a good time for such work. Cut the plants hard back, and trim with a sharp knife all broken root ends. The opportunity of forming old rose plants which have become neglected and overgrown with numbers of stems and old branches can be taken now. Take up such plants, divide, cut away all stems but one, trim the roots, prune hard, and replant. This will give new life to the roses, and if they be attended to, manured occasionally, and well pruned as they need it, the supply of new roses will be abundant and good.

Farm Notes.

HAWKESBURY DISTRICT—JUNE.

H. W. POTTS.

WINTER is again with us. Light frosts prevail and the weather conditions are unfavourable, owing to a shortage of rainfall. The busy stress of work which was prominent last month is relieved. The main crops are sown. The question of green feed for stock is occupying attention. Owing to the very light nature of the autumn rains and the dry condition of the subsoils we may anticipate a shortage, particularly in the hay crops, unless we are favoured with heavy rains.

The crops of Skinless barley flowered early this season two months after sowing. The yield, however, is light and the growth stunted. Rape and turnips are much heavier and better developed and vigorous.

Wheat.—The early part of the month will be late enough to sow the final crop of wheat for the season. Steinwedel is the best variety.

Barley.—Further sowings of Skinless and Cape Barleys may be made now.

Oats.—Further sowings of Algerian should be made, seeing it is the most reliable of all the oats as a rust resister.

Rye.—In view of the prediction that the winter will be dry and the hay crops short, it will be a prudent practice to continue sowing rye throughout the month. This crop in the past has always responded during the prevalence of dry weather and affords a good class of forage when other crops fail.

Vetches, Peas, Beans.—In the light sandy loams of this district these crops only do well when provided with a fair supply of artificial manure, such as basic slag or superphosphate with kainit up to 4 cwt. to the acre. These legumes are worth far more attention than is given to them. Apart from their value as fodder they form a valuable medium for enriching exhausted soils with nitrogen and humus.

Where the land is fairly rich a crop of Crimson clover may be sown.

Turnips and Swedes.—It will be necessary to keep up a thorough system of cultivation throughout the month and thin the rows freely. These remarks also apply to crops of Field cabbage, kale, Kohl rabi, and Tree kale.

Onions.—The young seedlings are now sufficiently grown to be planted out into well-drained, sweet, fairly rich soil. Where the soil is loose and sandy, but deficient in plant food, it should be enriched with well-decayed, farm-yard manure—from thirty to forty loads to the acre. Failing a supply of this, a good combination of fertiliser is :—

Dried blood	400 lb.
Bone-dust	300 ,,
Superphosphate	150 ,,
Sulphate of potash	270 ,,

Apply at the rate of 8 cwt. to the acre.

Rape.—One of the most useful and profitable crops to give attention to at this time of the year is rape, especially in the district where maize is largely grown. Rape forms one of the most effective crops for preceding maize and getting the ground into good condition. Rape is a quick grower and the green, succulent and relishable fodder is available for all classes of stock in eight weeks after sowing.

The late-sown sorghum crops have proved a most serviceable stand-by for the stock in a green form up to the end of last month. Some has been converted into hay and will be used as chaff during the winter. The main crops have been converted into stack ensilage and will provide food next summer when other food is likely to be scarce.

Maize stalks have been cut and shedded and converted into stover for winter feed for dry stock.

It will be advisable to get land cultivated in preparation for the maize and potato crops.

Clarence River District.

T. WALDEN HANMER.

Since the early part of April we have had no rain, except for a few isolated showers, and we are anxiously looking for a little moisture, as the ground is very dry. A little "droopy" weather, too, would be almost certain to delay the frosts, which most of us do not care about seeing.

Although last year was supposed to be an exceptional year (so a good many old hands informed us) for the growth of rubbish of all kinds, the season just over has beaten it badly in our opinion, and most of us have a tremendous crop of herbage to clear preparatory to ploughing. Where the land is not wanted for cropping immediately this should be ploughed in and allowed to rot, and not burnt off. Owing to the dry weather prevailing we are not so forward with our ploughing as we should wish, but we are endeavouring to get all our wheats, oats, &c., in this month.

In April number of the *Gazette* the writer informed readers of the particular varieties of wheats, oats, barleys, &c., that were to be tried at the Grafton Experimental Farm this coming season. It would be a very good thing if farmers and dairymen in the district visited the Farm in the early part of the spring and see for themselves the "greenstuff" that these cereals yield, and they could also note any that *did* take the rust and otherwise. Last year a number of Richmond River dairymen were at the Farm and expressed themselves as surprised and pleased at our wheat crops.

Ensilage.—This valuable fodder can be made in this semi-tropical district very often when haymaking is quite out of the question. How many of our farmers are acquainted with the word "ensilage," to say nothing of its manufacture? And how many stacks of ensilage (pit and tub silos are still scarcer) are there in this district? There are only two that we know of

except those on the Farm! The past has been a favourable season to store up fodder in the shape of ensilage. We have made some during the last three years, and have been most successful each time. Samples of this season's manufacture were exhibited at Grafton and Maclean shows, and were the subject of much discussion. Some wise-heads who saw our silage being stacked shook their heads, and said we were wasting time, and the result would only be a "muck heap"! However, we have proved that the result is very successful, except, of course, for the waste that must occur in any stack ensilage. We have, however, the pleasing prospect of possessing a "100-ton tub silo" (made of local timber according to Mr. Brooks's plan, see *Agricultural Gazette*, December, 1906) in the near future, as the contract has been duly signed for the building of the same. Also the "tub" will be brought even more up to date by having a No. 13 Ohio silage cutter with blower attached for filling it. This will bring our dairy plant up to a high standard of perfection.

Onions.—June is a good month to plant onions. Sow at the rate of about 5 lb. seed per acre in drills 2 feet apart, and cover lightly with a roller.

Cattle Cabbage and Field Peas may also be sown this month.

Vegetables.—Sow peas, broad beans, cabbage, lettuce, turnips, &c., &c.

Fruit-trees.—Plant out evergreen trees, such as oranges, lemons, &c.

GLEN INNES DISTRICT—JUNE.

R. H. GENNYS.

Some Hints on Selecting Seed Maize.

IN New England much of the maize is still in the field, and now is the best time to select cobs for seed as the character of the stalk whereon the cob grows can be determined. There is no object in growing tall, slender stalks for grain, these being generally late in maturing and inconvenient for harvesting. Short, sturdy stalks are the best for early maturity and allow of more nutriment being concentrated in the grain where it is required. Early maturing sorts are the only reliable ones for the tablelands where the season is so short. The cob should be borne close to the ground. If possible, select from stalks that have more than one cob, but these must be of at least average size and possess other good qualities hereinafter mentioned. Should there be only a few of these tie them together and shell separately, planting in a row by themselves and keeping them as males for next year's seed—that is, leaving the tassels (tops) on. The seed from double-cobbed stalks if used in this way will greatly help in promoting seed from other rows adjoining or close to them that have had the tassels (tops) removed by either cutting off or pulling out when they first appear. Save the

best cobs from these detasselled rows for the seed for the following year. By continuing the selection year after year very much may be done in improving the quantity and the quality of the crop and preventing deterioration.

Seed Maize should not be allowed to fertilise itself —in-breeding soon deteriorates it. When detasselling also examine the rows intended for male plants, and if any show signs of not cobbing well remove them at once and in no case allow them to bear tassels, as these distribute pollen very freely and may do no end of harm. If the maize is already pulled, but not shelled, much good may be accomplished by choosing the best cobs and planting from their seed, using seed from one cob for each row and detasselling every other one—and even, if this be considered too much trouble, good can be accomplished by simply planting grain from the best cobs. These should be true to the type they represent and uniform in colour and shape throughout.

In Dent Maize there is always more or less of a depression or hollow along the top of the grain.

In Flint Maize there is no hollow, the kernel being smooth on the surface and more rounded. Generally speaking, where peculiarities of type do not demand otherwise, a good cob of maize should be of a cylindrical shape—that is, well rounded and the same circumference from end to end,—uniform in colour and shape of grain. The rows should be nearly straight from butt to tip—kernels wedge shaped, deep, closely packed together. Core when stripped of grain should not be too large; the proportion of grain to core should be from 80 to 90 per cent. Tapering cobs and those containing grain of uneven size are apt to produce a small percentage of grain to core. Cobs with only grains here and there, badly filled at tips, and grain of uneven size, should be avoided; well-matured hard grain is much preferred to that which is soft and immature—if kept for over twelve months and still sound all the better. For New England the following varieties have done the best so far: Iowa Silvermine, Pride of the North, and Riley's Favourite being specially recommended.

With respect to planting grain from the butt, the centre, or tip of cob, experiments in America go to show that after years of trials there is only a very small difference in the results, good sound grain on a good cob, as described growing on a prolific stalk, being the main points. To obtain pure grain no two varieties should be planted at less distance than half a mile apart or cross fertilisation is bound to take place unless the tasselling occurs at widely separated periods.

The Cross-breeding of Sheep—A Correction.

In the May issue under the above heading the Southdown ram was described as first prize, New South Wales Sheep Breeders' Association Show, Sydney, 1906. This should have applied to the champion Border-Leicester ewe. The Southdown ram obtained first prize at the Christchurch, New Zealand, Show, 1905.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Sub-Editor not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1907.

Society.	Secretary.	Date.
New South Wales Sheepbreeders' Association ...	A. H. Prince ...	June 24 to 27
Hay P. and H. Association	C. S. Camden ...	July 24, 25
Condobolin P. and A. Association	W. Maitland ...	,, 30, 31
Forbes P., A., and H. Association	N. A. Read ...	Aug. 7, 8
Narrandera P. and A. Association	W. T. Lynch ...	,, 7, 8
Royal Agricultural Society of New South Wales—Grand Horse Parade and Sales.	H. M. Somer .	,, 7, 8, 9, 10
Gunnedah P., A., and H. Association	M. C. Tweedie ..	,, 13, 14, 15
National A. and I. Association of Queensland ...	C. A. Arvier ...	,, 13 to 17
Parkes P., A., and H. Association	G. W. Seaborne...	,, 14, 15
Murrumbidgee P. and A. (Wagga Wagga)	A. F. D. White ...	,, 21, 22, 23
Northern Agricultural Association (Singleton) ..	C. Poppenhagen ..	,, 21, 22, 23
Grenfell P., A., and H. Association	Geo. Cousins ...	,, 27, 28
Junee P. A. and I. Association	T. C. Humphrys...	Sept. 4, 5
Albury and Border P., A., and H. Society	W. J. Johnson ...	,, 10, 11, 12
Young P. and A. Association	G. S. Whiteman ..	,, 10, 11, 12
Cootamundra A., P., H., and I. Association ...	T. Williams ..	,, 17, 18
Cowra P., A., and H. Association	E. A. Field ...	,, 18, 19
Wyalong District P., A., H., and I. Association ...	S. G. Isaacs ...	Oct. 1, 2

1908.

Albion Park A., H., and I. Society	H. G. Frazer ...	Jan. 15, 16
Camden A., H., and I. Society	A. Thompson ..	Feb. 19, 20, 21
Bega A., P., and H. Society	W. A. Zuegel ...	Mar. 4, 5
Gundagai P. and A. Society	A. Elworthy ...	,, 24, 25
Walcha P. and A. Association	S. Hargraves ...	Apl. 2, 3
Upper Hunter P. and A. Association (Muswellbrook)	Pierce Healy ...	,, 8, 9, 10

[3 Plates.]

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Agricultural Gazette of New South Wales.

The Cattle Tick: Tick Infestation, Tick Fever, Preventive Measures, and Treatment.

[Continued from November, 1906, page 1157.]

JAS. D. STEWART, M.R.C.V.S.,
Government Veterinary Surgeon.

III.

Prevention of Infestation.

UNFORTUNATELY, an efficacious agent for the prevention of infestation, sufficiently long to be of practical value when applied to large herds of un-

Portion of hide grossly tick infested.

handled cattle, has not yet been discovered, notwithstanding many extensive and costly attempts. Agents fatal to ticks in solution exert no lasting

influence when dry, while others that remain semi-fluid prejudicially affect the health of the animals. In America small herds are smeared with oils three or four times weekly during the tick season, but the liability of oils to scald the cattle precludes their use in a semi-tropical country like this State during summer months, other than as an application to the face and lower portions of the legs.

Valuable animals that are housed may be kept clean by special attention to stabling or yarding, and by daily grooming and dressing, but with ordinary herd beasts that are never housed and seldom handled, prevention of infestation practically means the eradication of the tick from the pastures. In certain localities inimical to the propagation of the tick, eradication may be brought about by natural influences in the ordinary course of events; but in places congenial to tick life, such as our coastal areas, it can only be accomplished by serious and well-organised effort in the following directions, *i.e.* :—

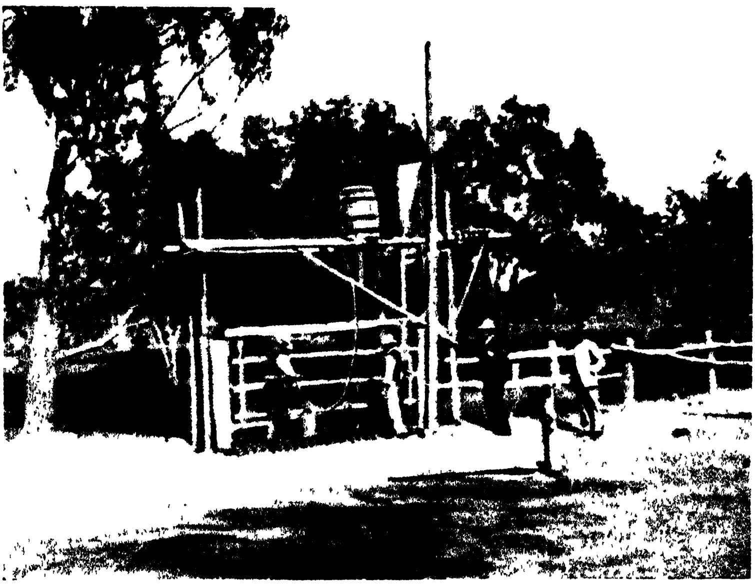
(*a*) *Improvement of pastures.*—Experience has taught that ticks thrive best in rough, shrubby, unimproved country, which affords great protection to the laying females, their eggs, and the larval progeny. Improvement of the pasture reduces this protection, and consequently diminishes their propagation. The most successful improvement is undoubtedly cultivation of crops. When cultivation is not practicable, considerable benefit may be derived from clearing the land of fallen timber, shrubs, weeds, &c., and burning off the grass whenever opportunity offers. The enclosure of cattle runs, and their subdivision into convenient areas by the erection of secure fencing, cannot be too strongly advocated, to guard against infestation from straying beasts, and to facilitate the control and management of the stock, and to make a clean muster possible when dipping is carried out, a precaution that is essential to the success of the treatment.

(*b*) *Withholding suitable hosts.*—As the propagation of the tick cannot take place in the absence of a suitable host, it is practicable to eradicate the pest from isolated areas by excluding stock therefrom for a period of from six to nine months, according to prevailing climatic conditions. This practice of "starving the tick out" has been adopted by Dr. J. R. Morgan, Veterinarian of Louisiana, U.S.A., in his "feed lot" method of eradication, by which cattle are freed of ticks by being removed three times, with intervals of twenty days between, to clean pastures, and allowing the contaminated pastures to become clean by being kept unstocked for a period of about six months. In this manner the matured females are left behind as they drop from the cattle, and the larval ticks, which hatch out in course of time, perish for want of a host. The ultimate success of this method is dependent upon the complete isolation of the stock and the prevention of reintroduction of ticks from without. Consequently, it is always advisable to take into consideration the character and geographical features of the pastures, and the completeness of their isolation, before putting this method into operation.

(*c*) *Destruction of infesting ticks.*—The systematic treatment of cattle and horses in infested districts at definite periods, to assure destruction of all infesting ticks before they mature upon their hosts, is not only an important preventive measure, since it rapidly diminishes the number of ticks, but is in itself, if carried out thoroughly, sufficient to eradicate the pest from the areas in which it is practised.

Treatment of Infestation.

The methods generally employed to remove ticks from cattle and horses are (1) hand-picking and grooming, (2) hand-dressing and spraying, and (3) dipping.



Spraying crush on Queensland Border.

Hand-picking and grooming.—This method is usually practised on small herds, and, while being somewhat laborious, is very effective if properly carried out each day. The larger ticks are removed by hand, and the smaller forms are scraped off by means of a curry-comb or blunt knife and subsequent grooming with a dandy-brush. All parts of the hide should be minutely gone over daily, special attention being given to those parts usually frequented by the parasites, and with horses to the manes and tails in particular. As the ticks are picked off, they should be put into a small can and destroyed by burning, together with the sweepings from the floor, at the completion of the grooming. Groomed working horses that sweat freely seldom become badly infested.

Hand-dressing and spraying.—The usual method of treating small lots of quiet horses and cattle is by hand-dressing or smearing, and by spraying, by which means a reliable tick-destroying solution is applied with a sponge, rag, syringe, or spray, so as to be brought in actual contact with the infesting ticks. In America, it is the practice to smear small herds with a mixture of 1 gallon of kerosene, 1 gallon cotton-seed oil, and 1 lb. of sulphur, or with one composed of equal parts cotton-seed oil and crude petroleum, or with Beaumont crude oil alone, and the treatment is pronounced to be efficacious both as a preventive and as a curative if applied two or three times weekly. Preparations of oils were tried in Queensland, but they scalded the cattle so severely that their use was abandoned in favour of the arsenical solutions. As a permanent method the use of the spray is to be recommended, as it is both expeditious and economic. It has for some years been adopted by this Department to a considerable extent on the Queensland border for the treatment of working horses admitted from certain areas in that State, under special conditions. At appointed crossing-places, "crushes" or "bots" are erected, as shown in the illustration herewith. The horse is quietly walked into the structure, and when properly secured is thoroughly sprayed with an arsenical solution. Special attention is bestowed upon the mane and tail; the latter being put into a canvas bag filled with the solution to ensure its thorough saturation. During winter months the whole body is groomed after spraying, by means of a stiff brush, to make certain the solution reaches the skin. This is a necessary precaution, and one of special value when the animal's coat is thick and long. The force necessary for the spray is obtained by placing the wooden cask containing the solution on an overhead platform about 12 feet high. The cask is protected to prevent the solution on standing becoming concentrated by evaporation or diluted by rainfall. At the bottom of the cask is a tap to which is connected a convenient length of india-rubber ¾-inch tubing, carrying an adjustable sprinkling nozzle. The floor of the "bot" is made of concrete, covered by a wooden platform, and drains into a sunken receptacle, from which the solution is again used after straining. On small farms where a few beasts only have to be treated, a hand-spray or force-pump, such as is used by orchardists to spray fruit trees, may be used instead of the elevated cask. For pregnant animals, and valuable young and quiet stock, spraying is undoubtedly preferable to dipping, owing to less risk attending the treatment, but it is not so reliably efficacious, and must be repeated at shorter intervals.

Dipping.—The most expeditious and efficacious method of treating infested animals is, undoubtedly, dipping. It is also the only practical method of treating large numbers of unhandled cattle and horses. In dipping, the animals are caused to plunge into a tick-destroying solution contained in a narrow tank, so as to become thoroughly submerged, and on rising to the surface to swim in it for some distance. With a properly constructed dip, complete appliances, convenient yards, and an efficient staff, it is

possible to treat the animals at the rate of from four per minute without effort, while the process of submersion and swimming in the solution ensures more perfectly than other methods the thorough wetting of their skins.

The Dip.—As it is necessary for all dips erected in this State to be approved by the Department, specially prepared plans and specifications are obtainable on application to the Chief Inspector of Stock. In the preparation of these plans and specifications, the experts of the Department have endeavoured to take advantage of the good features of the many and varied dips hitherto constructed, and to eliminate those objectionable. The fact that over 35,000 head of cattle and horses, that were introduced from Queensland during last year, passed through the dips on the Border with only four casualties, that occurred in the yards, is substantial testimony as to their serviceableness. The length of the dip may be varied according to requirement. Those used for Border operations are 32 feet long, while in Queensland, for the treatment of dairy stock, many

Texas dip, looking towards entrance.

Side view of Texas dip, showing crush and end of draining yard.

are but 20 feet in length. It is, however, essential that the depth of fluid at the entrance should be not less than 7 feet.

Dips are constructed of either hardwood, concrete, or brick, according to their respective cost, nature of site, and local requirements. The dips on the Queensland Border were built some years ago, and are constructed of hardwood. On the whole, they have proved very satisfactory, although occasional leakage, through imperfect caulking, had to be rectified, and in one instance the sides bulged in slightly. In the coastal districts of Queensland a great number of concrete dips have been built, and have given satisfaction; but owing to the difficulty of obtaining in the back country the services of an expert concrete-worker, and to the yielding nature of the soil in which the dip is often sunk, the occurrence of leakages and evident cracks have rendered a number of concrete dips

Sheltered crush and tanks for boiling solution at Goondiwindi dip.

unreliable, if not altogether useless. Even a well-constructed concrete dip will allow an appreciable quantity of the solution to escape if its interior is not "faced" by painting with neat cement, about the consistency of paste, while "green," and again immediately before the first coat dries. It is also of interest to note that a concrete dip absorbs liquid to about 10 per cent. of its bulk for the first month or two after being filled. Recently dips have been constructed of bricks lined with cement, and are said to be very serviceable. With wooden dips it is necessary to puddle the soil about them; but with concrete and brick dips the soil can be loosely filled in, and thus obviate earth pressure, which is often considerable.

Some time ago the "cage dip" was introduced in Queensland. It consists of a sunken tank 9 ft. x 9 ft. x 3 ft., a movable cage, and necessary

mechanism. The animal to be treated is walked into the cage, which is precipitously lowered into the tank by pulling a lever, until the animal is submerged, and rapidly raised again by means of horse and mechanical power. After seeing horses and cattle treated by means of the cage-dip, it was decided to adhere to the plunge dip and spraying in the operations of this Department.

Medicament used, and Preparation.

Many medicaments fatal to ordinary parasitic insects have but little or no effect upon the cattle-tick, owing to its extreme tenacity of life. Others poisonous to this tick are equally fatal to the host. Numerous experiments have been carried out in America, Queensland, and South Africa, with a view to discovering an agent capable of general application that will destroy the tick without incurring any risk of injuring the host when dipped in it; but so far the problem remains unsolved. The nearest approach to success was obtained in Queensland, by use of an arsenical solution similar to that which has been employed for over 100 years to free sheep of parasitic life. It is understood Mr. Mark Christian was first to apply the arsenical solution to cattle-tick at St. Lawrence, near Rockhampton, Queensland, in about 1895.

In America, after many failures, stock-owners have adopted a dip composed of crude oil, the so-called Beaumont oil, obtained from certain wells near Texas, U.S.A. This oil contains about 1½ per cent. of sulphur, and is said to be distinctly superior to others that have been used there; although its use is not always unattended by ill-effects upon stock treated. So far as can be gleaned from official reports, the oil dip does not appear to have any advantage over the arsenical solutions.

There are a number of tick-destroying medicaments at the present time on the market, but the most efficacious all contain arsenic. The Stock Departments of both Queensland and this State have adhered to modifications of the arsenical sheep dip. The formula adopted by this Department, a modification of that originally used in Queensland, is as follows, *i.e.* :—

Arsenic (white) (AS_2O_3) .	8 lb.
Washing soda (Na_2CO_3)	6 lb.
Common hard soap .	1 lb.
Stockholm tar (best) .	1 gallon.
Water added to .	400 gallons.

Directions for mixing.—The stipulated quantities of arsenic, soda, and soap (cut into thin slices) are put into about 70 gallons of water in the 400-gallon tank and boiled until thoroughly dissolved, when 1 gallon Stockholm tar is slowly added, with constant stirring of the mixture. On the tar being incorporated, the tank is gradually filled with water and the mixture kept boiling from one to two hours. The solution thus prepared is a homogeneous mixture of a dirty white colour, possessing the odour of tar, and forms an evident lather on being stirred.

The present official formula of the Queensland Stock Department is a further modification of the above, inasmuch as by using caustic soda and tallow, the soap is made during the preparation of the mixture. Consequently, in localities where commercial hard soap of a good quality is difficult to obtain, this method of preparation is preferable to using quantities of "home-made" soaps of various degrees of causticity. The official formula of Queensland is as follows:—

Arsenic (white) . .	8 lb.
Caustic soda . .	4½ lb.
Tallow	8 lb.
Best Stockholm tar	1 to 2½ gallons.
Water . ..	400 gallons.

Directions for mixing.—

(1.) Half fill with water a 5-gallon drum; add 2 lb. of caustic soda, and boil. Then add slowly 8 lb. arsenic. Add cold water in small quantities to prevent boiling over, until drum is full.

(2.) Boil 100 gallons of water in a 400-gallon tank; add 2½ lb. caustic soda, then 8 lb. tallow, and boil quickly. Add slowly, in a thin stream, necessary quantity of tar. When the whole of the tar has been added, boil from thirty to forty minutes, then add solution prepared in accordance with directions in (1). Gradually fill the tank with water, and keep the mixture boiling until the tank is filled.

No matter by which formula the mixture is prepared, it should be a uniform solution on completion. Its preparation is a simple matter, unless the tar used be of inferior quality, in which case considerable boiling and stirring will be necessary to bring about its incorporation.

On the mixture cooling, any scum that forms on the surface may be scooped off, while the presence of heavier insoluble residue may be detected by drawing the end of a long batten across the floor of the tank. If the residue is excessive, the probabilities are the mixture has not been properly prepared, or some of the ingredients are grossly adulterated. When due to the former cause, further boiling is necessary. As a preventive to the residue passing into the dip, the exit tap should be placed in the side of the tank about 3 inches from the bottom. In this manner a small depth of solution is retained and may be taken out separately and disposed of if advisable.

The boiling tanks should be provided with movable, closely-fitting lids, to save excessive evaporation, and to protect the solution. When the mixture is allowed to stand any length of time, the loss from evaporation must be made good by adding water, while reboiling freshens it up considerably.

Periodic analysis of solutions.—It is the practice of this Department to have samples of the solution contained in each of the dips submitted at least every three months for chemical examination. Separate samples are taken immediately before and after stock are dipped. On any departure from standard strength being indicated by the analysis, necessary

correction is made, and the result confirmed by further immediate analysis. Our experience furnishes conclusive proof that it is not possible to maintain the dipping solution at a constant strength for a lengthy period without the assistance of periodic analysis. Apart from variations in the proportion of arsenic present, its greatest tendency is to become too alkaline, or caustic, a condition that commonly causes scalding in stock.

Care of ingredients and appurtenances.—The various ingredients and appurtenances used in connection with the dip should be kept in a securely-locked storehouse. In some conspicuous place a notice should be exhibited warning travellers of the poisonous nature of the dipping fluid, as instances have occurred in dry times where men have either tried a mouthful or two themselves or given their horses or dogs a drink. Buckets or utensils that contain or have contained arsenic or the arsenical solution should have the word "poison" painted upon them.

During summer months the casks containing the soda should be covered with a damp bag to prevent concentration of the alkali by evaporation of contained water. It is always advisable to use soap in bars of known weight, so that the quantity to be used may be estimated by the bar, as soap loses considerable moisture and consequently weight, on being stored during summer time, and thereby becomes concentrated.

There are many brands of Stockholm tar to be had, but only the best should be used, as inferior brands are a frequent cause of scalding.

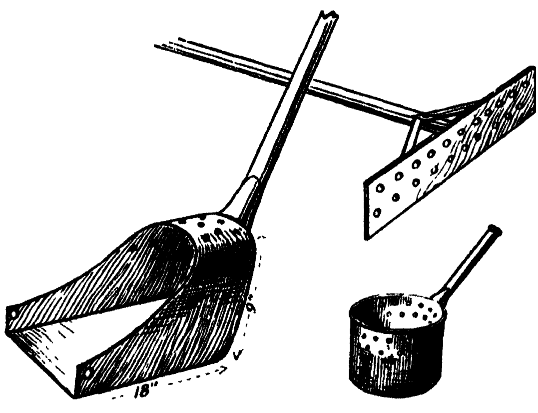
Care of Dip and contents.—In filling the dip, the first few tankfuls of solution emptied into it should be cold; but later on, when the quantity of fluid in the dip is sufficient to keep the temperature low, the solution may be added whilst hot, if desired.

During dipping, a scum composed of hair, dirt, and froth collects on the surface of the fluid, and is particularly noticeable during periods when animals naturally cast their coats. This scum should always be removed at the completion of dipping and also during the process if it becomes excessive, as it is apt to settle and decompose, causing contamination of the solution. On the morning following dipping, the more solid of the foreign substances carried into the dip, having settled at the bottom, are removed by means of the scoop, held by a long pole in apposition to the floor, and dragged along it by pulling on a length of rope attached to each side. All material removed should be deposited in an excavation, mixed with lime, and subsequently buried.

All extraneous matter having been removed, the depth of fluid remaining in the dip is then carefully measured and noted, so that the amount of water that naturally evaporates during the period of idleness may be correctly estimated. It is necessary to know this loss so that it may be made good before again using the dip, otherwise the solution gradually becomes concentrated and injuriously affects the stock treated. The careful keeping of records of the depth of fluid in the dip is of further

importance, for should the decrease in the fluid be excessive a leakage may be suspected. A simple and effective method of testing for the existence of leakage is to suspend a bucket in the solution with its opening on a level with the fluid in the dip, and if, after the lapse of several days, the fluid in the dip has a lower level than that in the bucket, loss by leakage is indicated. On the other hand, it may happen that the fluid in the dip may gain in volume during periods of idleness, especially after heavy rains following dry spells. If not traceable to faulty covering of the dip, in all probability this increase is due to soakage water gaining access to the dip, and so long as it exists the solution in the dip is always liable to become below standard strength. Usually it is easily dealt with by trenching round the dip so as to deviate the course of the soakage.

Disposal of contents.—Owing to the arsenic contained, the solution and refuse matter removed therefrom are dangerous to both animal and vegetable life, and especially to fish life. Consequently, it is necessary to arrange for their safe disposal. The most convenient way of treating a small quantity is to bury it in a deep pit. In dealing with a large quantity, as when the dip has to be emptied for repair, the arsenic should be "killed" and precipitated as the arsenite of lime, by adding ½ cwt. of freshly-slaked lime to every 400 gallons of solution to be treated, and stirring well. After standing twenty-four hours the supernatant fluid can be safely run over the ground, while the sediment may be used as an insecticide for spraying fruit-trees.



Utensils for removing foreign matters from solution in dip.

(*To be continued.*)

Pruning Vines grafted on Phylloxera-resistant Stocks.

WITH NOTES ON GRAFTING.

M. BLUNNO.

IN an article I wrote in the *Agricultural Gazette*, June, 1897, I dealt at length with the principles which regulated the pruning of the vine. I also described and illustrated several systems of training this plant, and gave the results of comparative experiments as to quantity and quality of crops obtained in each case. In the October, 1902, number of this journal I dealt with the influence of moisture in the soil on the fruitfulness of the vine, and also how to prune it in various climates, according to the rainfall. In this paper I will consider especially the pruning of vines grafted on phylloxera-resistant stocks, which have a decided influence on the cropping of the plant, according to the kind of stocks used and the nature of the soil in which the grafted vines are planted.

Riparia Gloire de Montpelier and Riparia Grand Glabre.

The best soil for these two sorts is a rich, deep, loose soil, which will retain moisture. Vignerons who have obtained these varieties from the State Viticultural Station, Howlong, have reported the extraordinary strong growth made by the stocks, also the large crops obtained after they have been grafted. I received reports as well concerning the lack of aroma of muscat in the Black Muscat Hamburgh, when grafted on these stocks.

In considering these different points it must be remembered that all types of Riparia stocks have a natural tendency to make any ordinary vine, with which it has affinity to graft, yield more largely. To this must be added the action of the graft itself, which, under ordinary circumstances, makes any graft crop more abundantly than the same vine not grafted. The nature of the soil the Riparias are usually planted in is also a powerful factor in increasing the quantity of the yield, and finally the fact that all the vines so far grafted on resistant stocks in this country are as yet very young and young vines are always more prolific.

Quantity and quality are often in apposition, therefore, some of the grapes obtained from vines grafted on phylloxera-resistant stocks, especially on Riparia, in certain cases may not be so full flavoured as those from older vines growing in poorer soils.

The question arises, then, as to what can be done to check the exuberant cropping of European varieties grafted on Riparia stocks to obtain a normal

crop of the highest quality. The soil in which Riparias thrive best, on account of its depth and texture, are alluvial soils, naturally rich ; therefore, if vines grafted on these stocks give too large a crop, the first thing to do is to use sparingly of fertilisers, especially stable manure, cow and sheep dung, nitrates, and any kind of fertiliser rich in nitrogen. When planting a new vineyard in such soil, it would be wise to see the results obtained in the neighbourhood with the same stock and scion before deciding on the distance apart to plant ; if the crop is too big, to the detriment in any way of the quality, a greater number of vines per acre should be planted, in order to have every vine attaining a more limited development. Then, again, the pruning should be attended to, and if the system of training is that of long rods, these rods should be cut a little shorter or a lesser number left; if the method of pruning is that of spurs, fewer spurs should be left. Also the number of times and the depth the land is ploughed and cultivated might be reduced as long as the soil is kept free from weeds.

A natural conclusion to be drawn from the above would be that in order to decrease the too great vigour of the vines grafted on Riparia, which results in too heavy a crop, it might be advantageous to plant the Riparias in soil that is not too deep and rich, avoiding for this variety the very rich flats. In such a position these stocks would not find the desiderata for its luxuriant vegetation, but the growth would be moderate and the bearing faculty not so exaggerated in quantity with a certain gain in quality. The great liking of Riparias for some varieties like Cabernet, for instance, is naturally the cause of large yields, and it would be a logical conclusion to recommend the grafting on Riparias of varieties which have not such marked affinity, the Chasselas, to wit. The Chasselas, in fact, has little affinity with any kind of phylloxera-resistant stock. The smaller degree of affinity would cause less vegetative vigour and less fruit; unfortunately, however, where stock and scion have no natural liking the whole plant does not live long, therefore, this course is not to be recommended.

Rupestris Stocks.

These will adapt themselves to dry soils, consequently are precious stocks in districts subject to long spells of drought. They will thrive in heavier ground than Riparias, but sticky, heavy soil, or soils that are very hard in summer are not favourable to their vigorous growth. If they are to be planted in such ground, this should, before planting, be well disturbed and then kept always well broken by deep ploughing and frequent scarifying, otherwise it cannot be expected that the vines grafted on these stocks will bear crops equal in quantity to those borne by the same varieties not grafted. The lack of affinity between these stocks and any variety grafted on them would aggravate the defect and cause not only still lower yields, but also the life of the grafted vine would be much shorter.

Riparia x Rupestris Hybrids.

Several Riparia x Rupestris hybrids have been raised to meet the conditions of medium soils, thus the reconstruction of vineyards is made easier in grounds which are not quite typical for either parents. At the same time, for soils which would be too heavy and hard for Rupestris stocks, other hybrids have been created, among which, for its high resistance to phylloxera, is to be commended the Riparia x Cordifolia-Rupestris No. 106. The number of mother plants of this kind at the State Viticultural Station at Howlong has been increased in order to be able to turn out a larger amount of cuttings and rootlings for distribution, specially among growers of the county of Cumberland, who have often to contend with hard, impervious, clay soils. The success of this hybrid in Sicily, which I noted four years ago when on a visit to Europe, encouraged me to propagate it more largely in this State, and, so far, all the stocks of this kind have and are growing vigorously in soils in which the various pure Rupestris had given mixed results. Also this stock grafts splendidly with three of the principal table-grape varieties in this county, viz. :—Black Hamburg, White Sherry, and Black Muscat Hamburgh.

Pruning.

If Rupestris stocks are planted in rich, deep, loose soil, capable of retaining moisture, they are apt to be extraordinarily vigorous, and such vigour is communicated to the vine grafted on it, with the consequence that the plant will make marvellous wood growth, while bearing a scanty grape crop. In the foregoing I mentioned what can be done to stay the excessive luxuriancy of vines, when their tendency is to overcrop themselves; now I shall refer to the manner in which the exuberant wood growth can be checked and transformed into grapes.

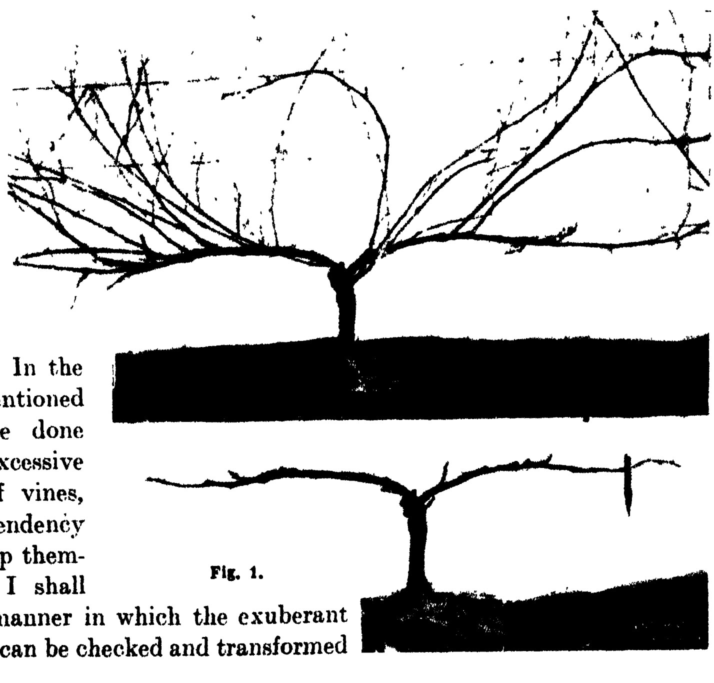


Fig. 1.

It often occurs that on some vines grafted on Rupestris du Lot enormous

canes bearing also many side shoots, nearly as thick, are seen, and the observer is surprised when looking into the thickness of the foliage, not to find the quantity of grapes the wood growth led him to expect. It is certain on examining the vine it will be found, that, when pruned, the number of spurs or fruiting canes left on the vine were far below the number the vine could have supported. The man who pruned the vine did not judge the strength and vigour of the vine properly, and, consequently, left too few buds. Leaving longer canes, or better still, more of them in the case of long pruning, or more spurs in the case of gooseberry-bush pruning, would mean dividing the strength of the vine into more branches, with the effect that every individual branch mould make medium growth, which is always the best for cropping.

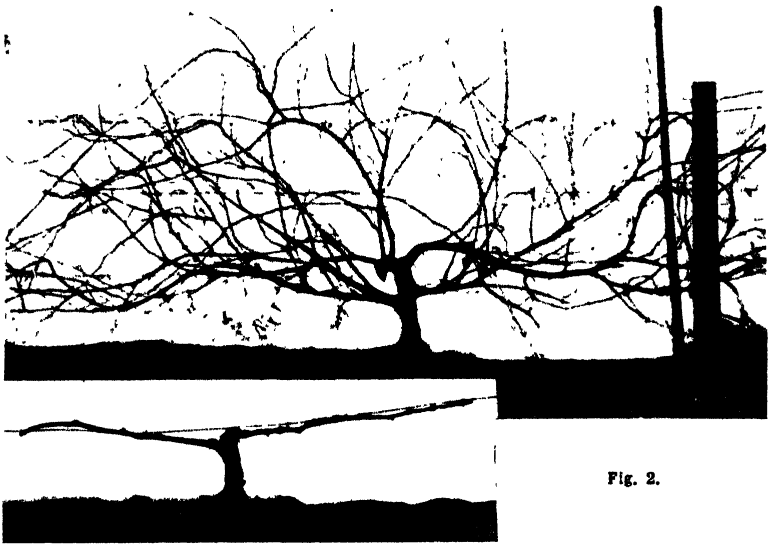
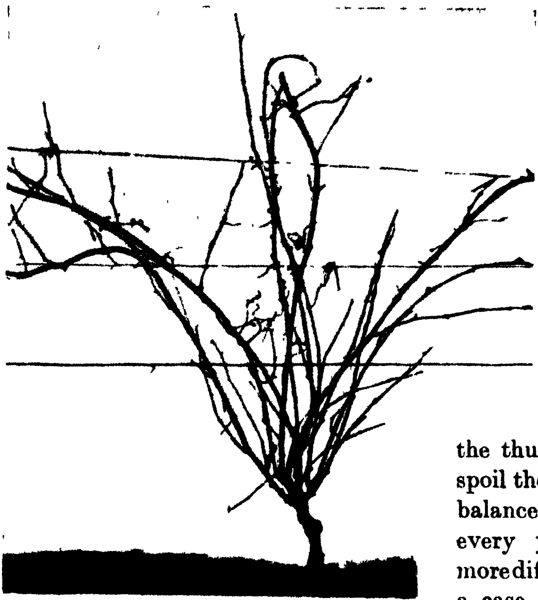


Fig. 2.

The canes instead of being stretched along the wires may be twisted round them or bent sharply in order to check the sap and encourage the canes to bear fruit. Some root pruning may also be resorted to, to decrease the vigour of the plant. Another way of checking a too strong vine is to prune it late—that is, when the end buds of the cane are well forward and about half an inch long. The operation must be done very carefully then. The vigneron before proceeding to prune a vine must see what effect the previous pruning had on it, and increase or decrease the number of canes or spurs according to the strength of the plant.

It may happen that a Rupestris stock has been planted in a soil not well suited to it, being, say, much too hard, or that there is little affinity between stock and scion; the grafted vine will then naturally resent the mistake and grow rather poorly. In such case, stirring the ground more deeply, thorough cultivation, green manuring, and the application of chemical fertilisers are



means to be adopted to sustain the plant through a period of years, at the same time the pruning should be in relation to the limited strength of the vine. Fig. 1 shows a vine which made poor growth, and the method of pruning same. When vines grow excessively strong they throw a number of shoots from the old wood, which, if not removed in the thumb and finger pruning, will spoil the shape of the plant and the balance between the leaders, and every year the pruning becomes more difficult and complicated. Such a case is shown in the upper portion of Fig. 2; it was purposely reduced to the proportions seen in the lower illustration. This is a case of drastic pruning in order to restore the shape and balance of the vine

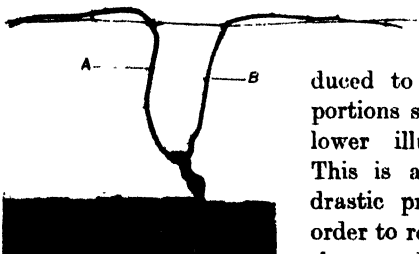


Fig. 3.

One season's unskilled or negligent pruning causes a lot of trouble in the future to remedy. A 2-year old vine, which was not thumb-pruned in spring, is shown in Fig. 3. The lower figure will give an idea of the best that could be done with it, with the intention of training it on the double-arm system. The eyes A and B will supply strong canes which next pruning will be cut back to two eyes, while rods for renewal of the arms will be obtained one on each leader. The buds below A and B have been removed.

In Fig. 4 is shown a 2-year old vine which was half destroyed by rabbits in the spring. The cane on the right has developed at the expense of the others, and is utilised for the prolongation of the stem.

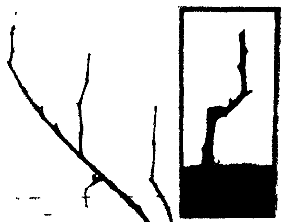


Fig. 4.

A mother stock of Rupestris du Lot is shown in Fig. 5,

trained on double arms. At the State Viticultural Station all mother stocks are not generally disbudded, because, being mother plants, they are only grown for wood; this, however, has the disadvantage that the vines soon get out of shape, arms become knotty and twisted, the stem branches off

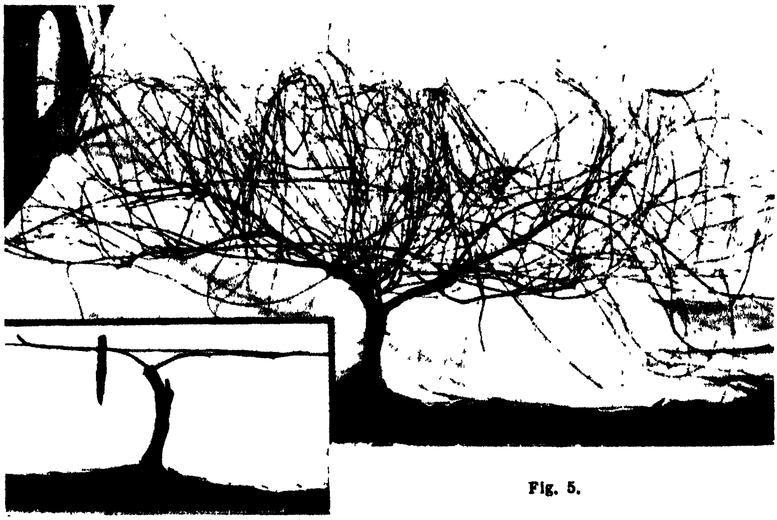


Fig. 5.

various cordons at different heights and generally overreaches the bottom wire. I have seen ordinary vines growing like this in private vineyards, old vines especially, that have been pruned year after year without an intelligent discrimination and without disbudding in spring. If such vines are

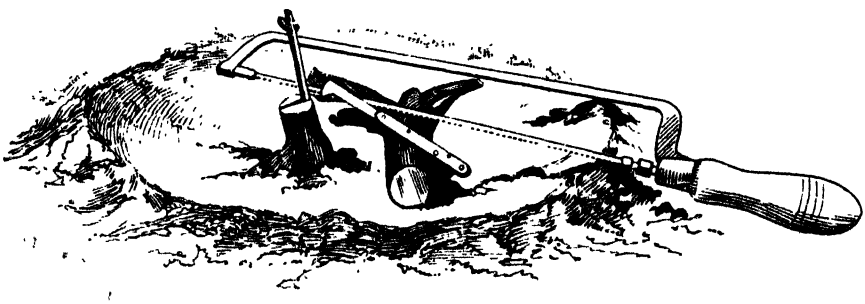


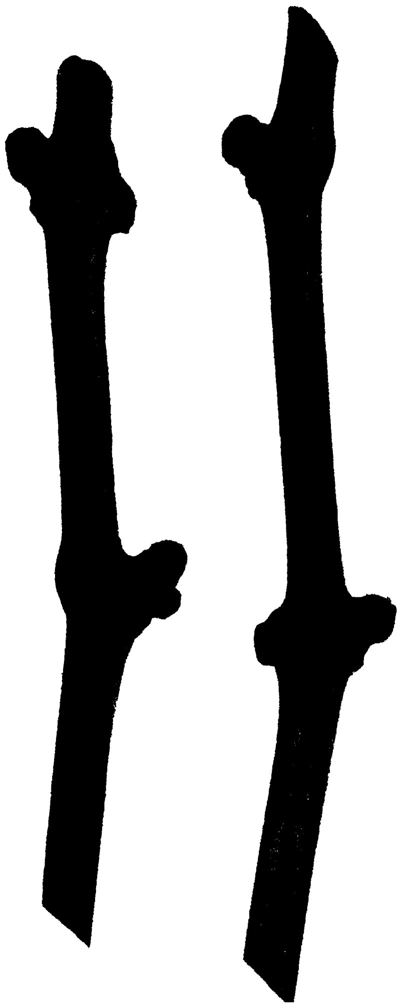
Fig. 6.

growing in heavy soil, in a district with a rainless summer, they will grow old in a few years and their cropping faculty fall off. Radical pruning is required in such cases, and the saw is called into requisition more than the secateur.

Grafting on Phylloxera-resistant Stocks.

I am often asked how to graft the ordinary vine on to the resistant stocks. The grafting is done just in the same manner as that of an ordinary vine on another ordinary vine.

Rupestris stocks in general should be grafted when they are young, viz., after the first or second year; then they take the graft much better. Rupestris du Lot, in particular during the first year of grafting, is apt to throw many suckers, which give growers some trouble to rub off. To mitigate this evil it is a good plan to cut the stem off a month before the proper time for grafting, so that the stock may bleed profusely and the excess of water responsible for the water-sprouts be so eliminated. Before proceeding to graft, the stem is cut again just half an inch below the level of the soil and the usual cleft graft made as is shown in Fig. 6. The scions are cut as shown in Fig. 7. A represents the cut on one side, in which the pith is reached; B is the obverse of the same scion, showing the cut by which the pith is not reached, but is left protected by a layer of wood tissues. The scion should be cut so as to have the eyes placed at right-angles with the cut. Some people prefer scions carrying one eye only; I think leaving two eyes is much the safer course. One or two scions may be inserted in the split, according to the size of the stock. For tying, raffia is generally used, which is steeped in a solution, made by dissolving 3 oz. of bluestone in half a gallon of water. After the steeping, the raffia is stripped between the fingers to remove the excess of the dip. After tying up some people protect the graft with clay, or at best with clay mixed with one-third cow dung, which is the so-called "St. Fiacre's ointment." Such materials for the protection of grafts are very primitive, and should be rejected. A good paste for the protection of grafts is made thus:—



B A

Fig. 7.

1 lb. yellow wax, 1 lb. turpentine, ½ lb. white Burgundy pitch, 3½ oz. of tallow; melted together and thoroughly mixed.

This paste is soft even when cool, it can be prepared long beforehand, cut in small blocks and wrapped in paper for use when required. The same paste should be used for the protection of big cuts or wounds, caused when pruning, by just smearing some of it over the cut.

Fig. 8.

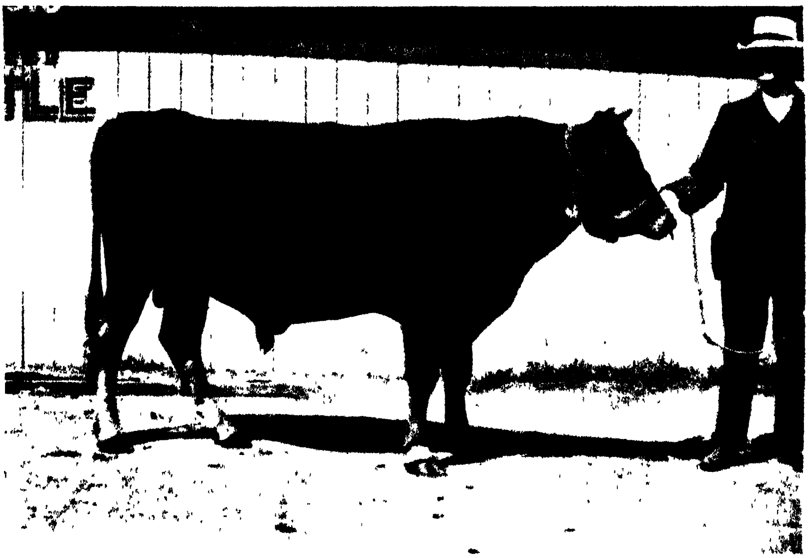
When the graft has been completed—that is, tied securely and waxed—fine soil is earthed up round the graft, as in Fig. 8; a small stake is driven near the vine to which the shoots are tied, lest the wind should shake the scion and spoil the process of union with the stock. The surface of the ground is frequently broken to allow the shoots to come through and suckers coming from the stocks carefully removed. The scion will emit a number of roots, which during the first year will help its growth; therefore, they may be allowed to remain, but they should be cut early in the spring of the following year and not allowed to grow again.

Phylloxera-resistant stocks are all more or less prone to throw suckers, and a number of them sprout on the stem from below the ground, often 3 or 4 inches deep. It is not enough to remove them once early in the season, as there is always a second and third flourish of them. If such suckers are allowed to grow, the portion of the stem from which they start grows much thicker and forms an irregular knotty knob, which alters the even cylindrical shape of the stem. A clean smooth trunk is necessary for the success of the graft the following year, and, to get a clean regular barrel, suckers should be carefully removed (never pulled), the soil round the stock being dug away, and the suckers cut close to the stem.

Dairy Cattle at Sydney Show.

M. A. O'CALLAGHAN.

In the May issue I dealt with some of the exhibits briefly, but did not refer to the largest class in the dairy cattle section, viz., Milking Shorthorns. Since the formation of the Milking Shorthorn Herd Book, this breed has increased considerably in numbers at the Sydney Show, but it is doubtful if the quality is keeping pace with the numerical development. To me the whole question appears to be just now one of milk *versus* beef.



No. 1.—Guernsey Bull, "Flaxy's Prince."
The property of Sylvester Browne, Esq.

Which type will prevail in the show ring is a question rather difficult to answer. Before going into the matter it will be well to cast our thoughts back to the history of the modern Shorthorn. By the modern Shorthorn I mean cattle entered in, or eligible for entry into Coates's Herd Book, representing the Shorthorn Society of Great Britain and Ireland. This really means the pedigreed Shorthorns of the British Isles.

We know that the old Durham or Teeswater cattle, which formed the basis of the modern Shorthorn, were heavy milkers, but we also know that all modern development until very recently had been entirely in the direction

of flesh rather than milk. The breed became famous for this purpose. The early maturity point was developed to a great extent, and the formation of the animal was built up by selection, so that every portion of the body would carry an even coat of flesh. Coates's Herd Book was formed for the purpose of registering therein the best animals of the breed, and as all the fashionable breeders who sought registration of their cattle bred practically for beef, it became a difficult thing to find any other strain of animals included in the herd book. No doubt some of the strains retained better milking qualities than others, and thus the tendency towards milk was more remarkable in some families than others. But the fact remains, nevertheless, that beef was the first consideration, and milk only a secondary one.

From this it will be gathered how difficult it is to select a bull whose ancestors have been registered in Coates's Herd Book, and who will have the great dairying tendency which our farmers require in bulls selected to mate

No. 2.—Jersey Bull, "Sir Jack," with his dam, "Lady Tidy" (imp.) and grand dam, "Rum Omelette" (imp.)

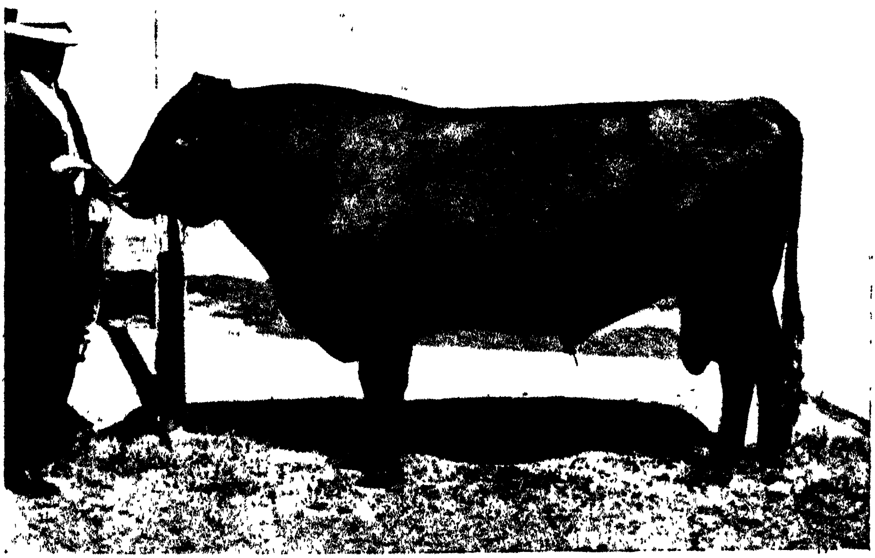
with their dairy cattle. Of latter years the English Shorthorn Society has done a great deal towards turning attention again to the milking qualities of the Shorthorn, and this point is being made a strong one by many breeders at the present day, but it will take considerable time before we shall have the pedigreed Shorthorn developed from a milking point of view to the extent which, for instance, the Guernsey, Jersey, the Ayrshire, or the Holstein has been.

Of latter years the British Dairy Farmers' Association has given special classes for pedigreed and unpedigreed Shorthorns at their annual shows, and in all cases the records of the unpedigreed animals are superior to the pedigreed. The reason for this is that many farmers, throughout the north of England especially, who never bred sufficiently high-class animals from a beef point of view to make it worth while registering in the herd book,

persevered with the milking characteristics, and were content to develop the breed mainly from its dairy point of view. These were not registered,

No. 3. Guernseys, "Flaxy I" and "Flaxy II."

and thus it is that a visitor to England to-day can obtain numbers of unpedigreed Shornhorn cattle of distinct dairy type, but it is difficult to



No. 4.—Red-poll Bull, "The Judge."

obtain many pedigreed animals which would satisfy the requirements of a judge of dairy cattle. The females are much more easily obtained than

males, because in every herd of Shorthorns there are some good milkers, but when these are mated with bulls bred for beef rather than for milk, it is doubtful if the dairying qualities will in many instances be transmitted from mother to daughter, or from mother to son. Hence it is that though a man may select a bull from a good mother, he may not get a deep milking tendency in his stock when mated with dairy cattle.

Pedigreed Shorthorn bulls when mated with pedigreed Shorthorn cows, although the latter may be good milkers, rarely beget animals as good as the mothers, the reason being no doubt that the tendency to lay on flesh is too

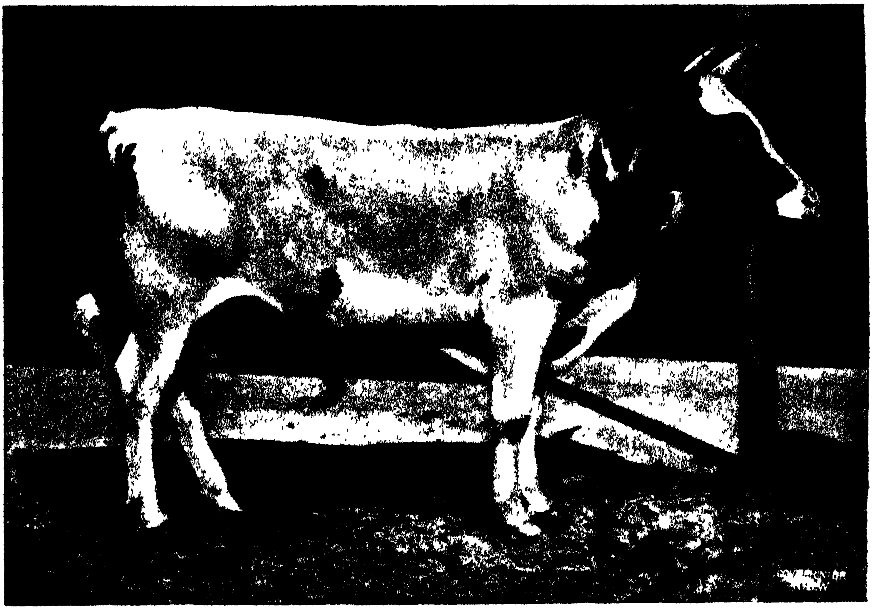
No. 5.—Holstein Bull, "Obbe II."

great for animals bred in this way to show up strong dairying characteristics. When, however, pedigreed Shorthorn bulls from good milking mothers are mated with cross-bred dairy cattle, the size and constitution of the animals are improved, without any serious lessening of the milking tendencies, but it is not wise to go too far in this direction.

At last Sydney Show in almost every Dairy Shorthorn class there were two distinct types of Shorthorn shown, viz., the bulls descended from sires and dams registered in Coates's Herd Book, and bulls descended from the Illawarra strains of cattle. The former type, in most instances, show too much of a beefy tendency to satisfy the requirements of a dairy judge; in

other words the bulls of this character were not on the whole sufficiently of a dairy type to warrant a man saying, "I will put that animal to cows of medium milking tendencies, and I will get a class of heifers with greater milking development than the mothers." Yet many of these bulls were placed in prominent positions, because they showed the pure Shorthorn type, whereas the Illawarra Shorthorns, in most instances, did not show the correct Shorthorn characteristics.

The mixing of types after this fashion is very confusing to a judge, and something should be done in the interests of dairying, and in the interests of the breed, to differentiate between these classes in our shows. Instances of how this mixing of types may influence breeders came under my notice



No. 6.—Ayrshire Bull, "Jamie's Ayr."

during the sales, and I knew of at least one instance where a man purchased an animal showing pure Shorthorn characteristics to mate with his dairy cattle, which will, in my opinion, only deteriorate the milking yield of his herd. He may get nice looking cattle in his first cross, but if he is to preserve the milking qualities of his herd, he will be forced to go back to some other breed, such as the Ayrshire, or the Guernsey, for his next cross. Well, no one can blame the judge for placing animals of the correct Shorthorn type in prominent places, because the class is for Milking Shorthorns, and unless he has extremely strong prejudices he must stick to type according to the wording of the schedule on which he is judging.

There is room for the two classes, and at the present time it seems desirable to separate them, especially in the male animals. Since the run set in on

animals of Shorthorn type there has been evidence of great desire to breed roan-coloured animals, and many a man has sacrificed his judgment of the points of a bull so as to secure this roan colour. In fact it is well known that many bulls from the beef-breeding stations have been tried in our dairy herds for the purpose of giving Shorthorn type and roan colour. This is scarcely wise. I still think there is a great future before the Illawarra Shorthorns if they are carefully bred, and the Shorthorn type selected for sires. Then in time all Ayrshire points would be eliminated and we would have in large numbers the same as we have at present in small numbers, animals of good size and constitution showing a good many of the characteristics of pure-bred Shorthorns, and with great milking tendencies. The return of good seasons, such as we have been experiencing on the

No. 7.—Jersey Bull, "Thespian."

Northern Rivers during the last three or four years, will give our young stock a greater tendency to lay on flesh than many dairymen imagine, and hence the greater necessity to keep a close eye on our breeding methods when dealing with dual purpose breeds like the Shorthorn.

In this month's issue some illustrations of Illawarra-bred Shorthorns, and one of a pure-bred Shorthorn, are given. The pure-bred Shorthorn is the animal which obtained the second prize in the aged-bull class, and which was considered by many to be the best bull of his type in the show. He was beaten by Mr. Cole's "Major VI," a bull of great dairy type, but rather lacking in the characteristic hindquarter of the Shorthorn. "Prince of Raleigh" (see Illustration No. 8), is a dark roan bull owned by Messrs. Matthews and Young of the Bellinger River. He won second as a yearling at the Royal Agricultural Society's Show, 1903, and has since filled out into

a very nice beast. A good many youngsters exhibited at the show, got by him, showed great dairying characteristics.

Illustration No. 9 shows his full brother, "Banker II," owned by the Scottish Australian Investment Co., of which Mr. T. Cole is manager. Both these bulls are entered in the Australian Milking Shorthorn Herd Book, and appear to be getting good stock.

Messrs White and Bell, of Muswellbrook district, purchased some very nice young bulls by "Prince of Raleigh."

Illustration No. 10, "Colac," is the property of Mr. Sylvester Browne, Minembah, Whittingham, near Singleton, and for a Coates's Herd Book bred bull he shows unusually good dairying points, with all the characteristics of a Shorthorn.

No. 8.—Milking Shorthorn Bull, "Prince of Raleigh."
The property of Messrs. Matthews and Young.

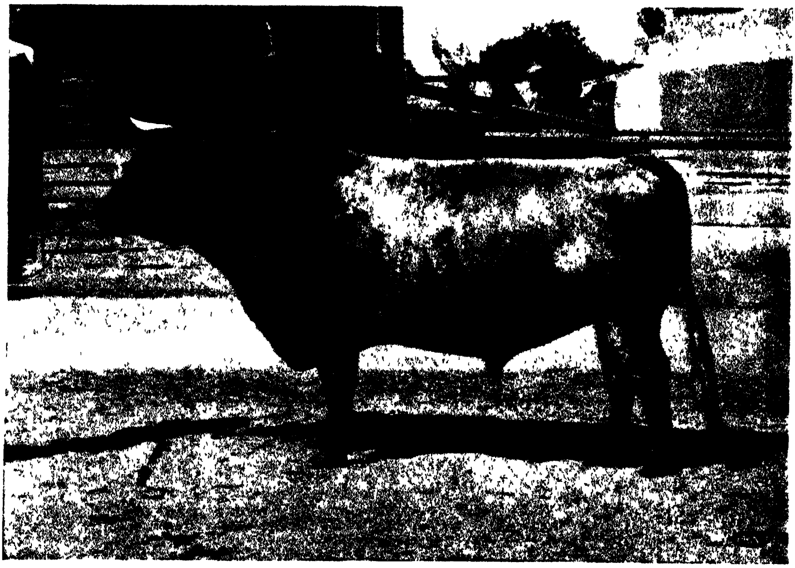
Other Illustrations.

These represent cattle exhibited by the State Stud Farm, Berry, in the non-competing section, with the exception of No. 1, viz., the young Guernsey bull, "Flaxy's Prince," which was bred by the State Government and sold to Mr. Sylvester Browne, Whittingham. This young animal is, practically speaking, but in the calf stage, and therefore does not show up well in a photograph. He is by "Rose Prince" (imp.) from "Flaxy" (imp.), and he promises to be a very fine dairy sire. His mother and full sister are seen in Illustration No. 3. The old cow, "Flaxy," is now about 13 years of age, and has been a constant breeder since she arrived in the State in 1898.

Besides being built on excellent dairy lines this cow shows wonderful constitution, having great depth, and with a well sprung rib. Her heifer, "Flaxy II," takes after the mother very much in constitution and type.

Illustration No. 2 represents the young Jersey bull, "Sir Jack," illustrated in the May issue, together with his dam and grandam, two imported cows; his great grandam, "Miss Lucy III," being also an imported cow of great dairy type. Since this young bull was exhibited at Sydney Show with these two cows, numerous applications have been received, both with a view to his purchase or lease, but his services are at present retained for the Berry Stud Farm.

Illustration No. 4 represents that beautifully symmetrical bull, "The Judge," an animal of the Red-polled breed, and built on excellent dairy lines. This bull is by the imported bull "Barrister" from "Lovely VIII" (imp.),



No. 9.—Milking Shorthorn Bull, "Banker II."
The property of the Scottish Australian Investment Company.

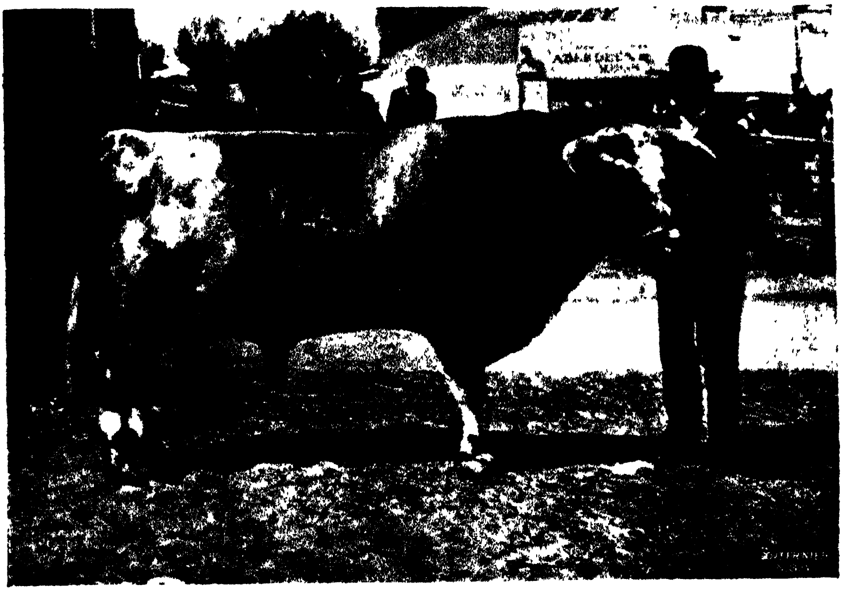
a cow that milked almost as well as any of the imported lot. It is proposed to transfer this bull to the Clarence River, where the breed is in some request.

Illustration No. 5 represents the Holstein bull, "Obbe II," by "Obbe" (imp.). He is a bull of wonderful constitution, and for a Holstein shows unusual quality. He is closer to the ground than most of his breed, and being descended in a remarkable degree from a heavy milking line of families he should get deep milkers wherever used.

Illustration No. 6, is that of the young Ayrshire bull "Jamie's Ayr," by the champion bull "Jamie of Oakbank," from "Miss Prim"; "Miss Prim" is

by "Mischief Maker" (imp.) from "Primrose" (imp.), and is a very handsome cow. This young bull is highly thought of, an offer of sixty guineas having been made for him at the show, but it is intended to reserve him for stud purposes at the State Stud Farm.

Illustration No. 7 represents the young Jersey bull "Thespian," by "Thessalian II" from "Pattibelle." He is a bull of true Jersey type, and as he has been sold to Dr. Hay he should be heard of in the show ring later on.



No. 10.—Shorthorn Bull, "Colac."
The property of Sylvester Browne, Esq.

The Success of the Ayrshire.

Probably the most notable feature of the dairy classes was the success of the Ayrshire strain of cows in the milking trials. The cow that gave the greatest yield is descended from Mr. Antill's famous Picton herd, and though not absolutely a pure-bred Ayrshire, has been bred on Ayrshire lines for thirty-five years. The stain in the Ayrshire pedigree is Shorthorn blood; but after thirty-five years there must be very little stain left.

Feeding Wheat Crops off by Sheep

R. W. PEACOCK,
Bathurst Experimental Farm.

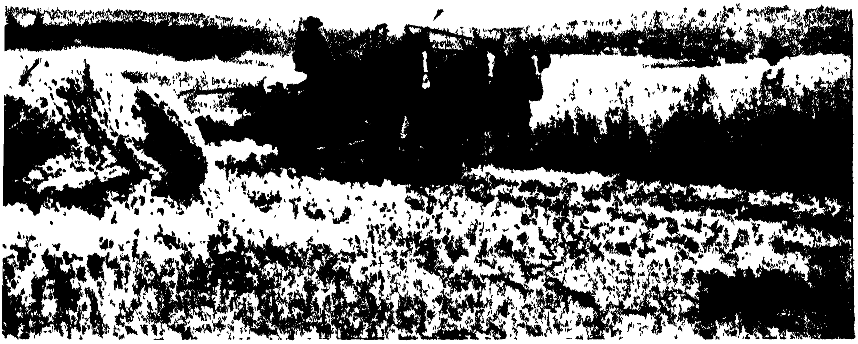
THE practice of feeding off the early wheat crops is one which is followed by many farmers who combine sheep-raising with wheat-growing. This practice, when discreetly followed, has much to recommend it. It also requires considerable judgment upon the part of the farmer. Wheats cannot be fed off advantageously indiscriminately. There are many points to be taken into consideration. Wheat grown upon light open soils, and sown early, may be

Feeding off Wheat by Sheep.

advantageously fed off. The tramping of the stock consolidates the soil, to the advantage of the crop. Soils which run together at the surface and contain a fair proportion of clay may be seriously injured by the tramping of the sheep. Soils which are rich in vegetable matter, and are what are termed rather strong for wheat, if sown early should be fed off. The heavy growth induced prevents the access of heat and sunlight, resulting in weakened tissues at the base of the stems, which often precedes a lodged crop. The eating off of the excess of leaves aids in preventing rust and other diseases, and strengthens the straw materially.

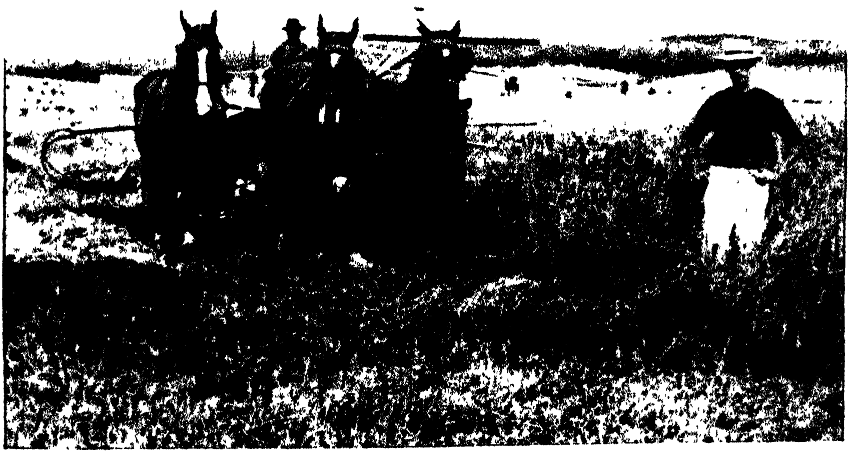
During seasons of good autumnal and winter growth crops may grow too rankly. Such are very susceptible to frosting, and if at all practicable should be grazed. Wheats such as the Lammas, Fifes, and others which have procumbent leaves and stems during the winter, and stool freely, are more suitable for grazing. Many of the new wheats have a more erect habit of growth, and stool sparsely; such cannot be grazed to the same extent as the former. In districts where dry early summers are the rule wheats should

not be grazed late in the winter, but should be let run up no later than the end of July. In districts where the rainfall can be depended upon throughout the early summer they may be grazed later.



Harvesting Wheat after being fed off.

Generally speaking, for grazing off, wheats should be sown early. Some soils are sufficiently forcing to compensate for early sowing, and may be sown later. Where wet winters are the rule, heavy soils, owing to too much



White Hogan lodged, not fed off.

consolidation by tramping, are not suitable for grazing. The crop should not be continuously grazed for a considerable period. It is preferable to subdivide sufficiently to ensure the eating off to the ground within a fortnight. Stakes

and wire-netting make an easily removable subdivision fence. Sheep, when turned into large areas of rank crop, trample and spoil more than they eat. Sheep should be taken out during wet weather. All areas should be thoroughly harrowed, to loosen the surface, after being grazed. The food supplied by early sown or winter-proud crops often proves very acceptable for the sheep during a period when green food is not plentiful. The laxative effect aids the digestion of dry grasses and other fodders. Care should be taken, or excessive scouring may be induced in some animals. Sheep in poor condition should be fed cautiously for a few weeks. Ewes and lambs, if judiciously fed, are much benefited by a change on to young wheat; the practice has been followed for many years at this farm.

The following are results of the crops as fed off during 1906:—

Variety.	Sown.	Fed off.	Height.	Harvested.	Yield per acre	
	1906.			1906.	bus.	lb.
Steinwedel ..	2 April	2 July to 9 July	15 in. to 18 in.	8 December	26	12
Bobs	3 ,,	2 ,, ,, 9 ,,	15 in. to 18 in.	10 ,,	29	27
White Hogan ..	3 ,,	Not fed off ...	....	21 ,,	25	27
White Hogan .	3 ,,	17 to 29 August	15 in. to 18 in.	21 ,,	18	16
Cleveland .	4 ,,	17 ,, 29 ,,	15 in. to 18 in.	27 ,,	25	2

The period of grazing Bobs and Steinwedel was favourable, the consolidation by the stock was not injurious, and the surface harrowed well. The period of grazing White Hogan and Cleveland was not so favourable, rain intervening. The soil was consolidated too tightly, and the harrows had very little effect. The portion of White Hogan not grazed on the heaviest soil lodged badly, but recovered, owing to subsequent favourable weather, sufficiently to mature a good crop of grain. The White Hogan and Cleveland, being later-maturing wheats than Bobs and Steinwedel, should have been sown earlier. The results, although not comparative, are instructive in showing the possibilities under the treatment.

RHODES GRASS AT PAMBULA.

MR. J. R. SMITH, Lochiel, Pambula, writes as follows:—"I put the seed in the ground in the early part of September, and in sixteen to twenty days I noticed the young plants coming up. It did not germinate quite so well as I expected it would, judging from what I had read. However, it seemed to make fairly good headway from the first, and in this respect seems to take the lead from *Paspalum dilatatum*, which, though a rapid grower once it gets a start, does not seem to be quite as quick at the beginning as Rhodes grass. I fancy Rhodes grass would soon spread, and the vigorous growth it makes should ensure heavy crops, and in that respect must lead most other grasses, both native and exotic. As to whether cattle eat it readily or not, I have not had enough experience to say; but if they do it will be a great addition to our grasses.

Second Rockdale Egg-laying Competition.

GEORGE BRADSHAW.

EGG-LAYING competitions, inaugurated at the Hawkesbury College five years ago, soon spread to the other States, and to the present date continue their popularity throughout Australasia, the interest in them never flagging, except in Victoria, the Government there discontinuing them at the close of April last, on the plea that they had served their purpose by showing the laying and paying abilities of a flock of young fowls. There is the further fact that there is not the same necessity for laying demonstrations in that State as

Miss Kemmis's White Leghorns.
1,473 eggs. 28 ounces to the dozen.

here, seeing that the production in New South Wales never reaches the demand of the population, and although foreign markets are available for the surplus of other States, New South Wales has been the only paying one.

In Queensland the fourth competition is in full swing. In West Australia there are two tests in progress; in New Zealand, two, and talk of more; and even in South Australia, the great egg-producing State of the Commonwealth, another competition has lately begun.

The inception of the competitions in this State resulted from a mild newspaper controversy between two breeders disputing over the laying capabilities of the breeds. From that time to the present the competitions have been flourishing in all the States. The original question as to one breed of fowls

being superior to another is as far from settlement as ever, and possibly as near solution as it ever will be, the results of all the competitions to date determining only what experienced poultry men always knew, viz., that black fowls will lay as well as brown, nor have whites superiority over parti-coloured. All the breeds that have ever competed in this State have made excellent records, while the same breeds, and frequently in the same tests, have put up performances so low as to be a mystery to their owners. The breed advocates have now surrendered their claim, and are happy in the thought that whether Leghorns, Minorcas, Orpingtons, Langshans, Wyandottes, Hamburgs, and others, the best of layers can be had in any of them, and should the strain they possess not be noted for prolificacy, it can soon be brought about by selecting and breeding from the best layers amongst these, and mating with good vigorous male birds. Some of the best layers

W. Wynn's White Wyandottes.
1,444 eggs.

at the competitions under review were the progeny of what a few years ago were poor performers.

The history of the laying competitions is well known in this State. They were incepted and held yearly at Hawkesbury College, but early in 1905 it was found the entrants were very much in excess of the College accommodation, and there being a desire to accommodate all, the proprietors of the *Daily Telegraph* arranged with Mr. J. McIntosh, of Rockdale, to conduct a competition of the surplus fifty pens, which was termed the overflow competition.

Hitherto the College had been doing good work by increasing their records each year, the laying having risen from an average of 130 eggs per fowl at the first test to 166; but when the Rockdale competition got going it was

soon evident that still greater results were to be had from fowls, the competition concluding on 31st March, 1906, with records unapproached in any part of the world. Every one of the 300 hens averaged 195 eggs each in the twelve months. The figures were astonishing, and had the unintentional effect of stemming the tide of American poultry importations, the people getting their eyes opened to the fact that in previous competitions every time the American birds competed they got beaten; the Rockdale competition showing that nowhere in the world had there been records made approaching those put up by the Australian hen on Australian soil, Australian climatic conditions and management, every hen competing in that test returned, less commission, a profit of 8s. 8d. over her food bill.

The first Rockdale test terminated on 31st March, 1906; the second, under the support and patronage of the *Sydney Morning Herald* was arranged

C. W. Bannister's White Leghorns.
1,412 eggs. 27½ ounces to the dozen.

to commence on May 1, a month later than that hitherto recognised as the best for obtaining good results.

The sixty pens contributed began their year's work auspiciously, and produced for May an average of seventy eggs per pen. High averages continued to the end of the eleventh month—March—which witnesses the close of the other competitions, and here the month's later start told on the fowls. For the eleven months an average of 1,133 eggs per pen had been laid, as against 1,117 for the same period at the previous test, but anyone seeing the birds at this time would have at once concluded that for this competition their best was over, the bulk of them having a most sorry appearance, through moult and the strenuous laying of the previous eleven months. The anticipations for the twelfth month were borne out, many of the birds ceasing production in March,

and finishing with an average of slightly over forty per pen for the month; but even with this falling off the sixty pens laid the grand total of 70,437 eggs for the twelve months, or an average of just on 1,174 for every pen in the test, as against 1,171 in the previous competition, thus eclipsing all records wherever made. For three or four of the later months of the competition one pen contained only three birds, but even with this the total number of eggs laid, came just on 196 eggs for each of the 360 hens. This, however, does not show all the improvements from the previous year, for owing to the fowls being more cheaply fed, a higher price for eggs throughout the year, and a larger number of them produced at a dearer period, the net profit, after deducting commission and food bill was over 11s. per hen.

C. J. Green's Buff Orpingtons.
1,345 eggs.

The appended report and results are from the *Sydney Morning Herald* of May 1.

The first egg-laying competition promoted by the proprietors of the *Sydney Morning Herald* and *Sydney Mail*, and personally supervised by Mr. J. McIntosh, at his farm, Rockdale, was brought to a close last evening with very satisfactory results. The majority of the entrants were gathered from all over the State—Grafton, Werris Creek, Singleton, Waratah, Wagga, and other places separated by hundreds of miles, contributing the sixty competing pens, only a few of them being even remotely connected with strains tested in previous competitions. However, despite this, a month late in commencing, and other handicaps to the making of high records, Mr. McIntosh not only brought the competition to the highest profitable issue, but did so with the smallest percentage of deaths yet recorded in any of these competitions, and was successful in the task of lowering his previous world's record in egg-production, a feat which many predicted would never again be accomplished.

Occasional individual high figures prove little to the poultry man, it being the average laying of the entire flock from which profitable deductions can be made. The fowls are contributed from breeders throughout the State, bred and reared under varied climatic and other conditions, and when such a collection is brought together under one management, then the year's average laying of the lot is a true test, the results affording a guide to poultry-keepers of the earnings of a flock of fowls. The present competition has not only been individually high, and fresh records made, but the true test, *i.e.*, the average of the whole flock, has been the highest recorded in any Australasian

laying competition. A 200-egg average for every hen in the competition was just missed through the bad performance of four or five pens.

The chief object of this competition was to show poultry-keepers the earning capabilities of a flock of fowls irrespective of breed or breeding, and kept in the most inexpensive way. The competition throughout was conducted by Mr. McIntosh on common-sense lines, which every one can follow, and he and the competitors are to be congratulated on the results.

Details of Results.

Name of Competitor and Breed.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	Total.	Weight.	Market Value.
														oz.	s. d.
1. Miss Kemmis, Haberfield: White Leghorns	105	129	148	142	152	142	122	122	122	111	108	70	1473	28	131 11
2. W. Wynn, Hurstville: White Wyandottes	71	76	114	150	157	160	144	134	120	107	125	86	1444	24½	126 10
3. C. W. Bannister, Pyrmont: White Leghorns	74	101	120	144	159	166	143	128	114	105	93	65	1412	27½	122 1
4. T. T. Casey, Maclean: White Wyandottes	65	132	153	130	131	149	137	142	119	86	93	63	1400	23½	123 1
5. Mrs W. J. Dennis, Wagga: Silver Wyandottes	46	92	136	155	134	133	145	128	120	104	120	67	1380	24	120 11
6. B. J. Beaumont, Peakhurst: White Leghorns	51	105	136	138	133	157	157	150	131	106	86	20	1370	26½	115 1
7. Fletcher and Hoskyns, Kew (V.): W. Leghorns	93	114	156	134	132	142	139	123	120	87	92	36	1369	26	119 2
8. F. J. Powney, Dulwich Hill: Brown Leghorns	80	104	129	132	135	136	145	131	124	107	93	40	1356	22½	117 6
9. C. J. Green, Carlingford: Buff Orpingtons	123	108	128	129	133	132	119	105	95	100	98	75	1345	23¾	121 8
10. E. T. Griffiths, Waratah: White Leghorns	74	99	124	135	134	140	133	152	124	103	87	31	1336	25½	114 4
11. W. Price, Fiji: White Leghorns	126	93	133	143	142	139	118	111	103	87	87	47	1329	27	116 8
12. G. Pitman, Rozelle: Black Orpingtons	46	55	138	149	152	165	148	127	101	93	97	54	1325	29¾	111 7
13. H. A. Jones, Thornleigh: Black Orpingtons	54	94	140	160	153	147	158	127	96	87	85	29	1310	23¾	110 0
14. Ontario Egg Farm, Clarendon, S.A.: W. L'hn	86	88	110	117	145	158	130	119	133	97	91	34	1308	25	112 1
15. W. Haydon, Hurstville: White Leghorns	117	98	114	139	152	156	132	126	108	81	68	16	1307	26¾	110 4
16. G. Wright, St. Peters: Black Orpingtons	106	143	110	129	125	116	103	107	99	99	92	74	1303	25½	120 1
17. Mrs. J. Spinner, Balmain: Black Orpingtons	63	80	149	136	138	131	140	126	93	73	81	62	1272	25¾	109 7
18. Johnson Bros., Marsfield: Silver Wyandottes	99	107	125	134	128	130	100	106	96	82	91	74	1272	22	114 6
19. G. Woods, Meroo Meadow: Brown Leghorns	83	90	88	120	131	146	141	137	127	95	81	21	1260	23½	106 9
20. W. Robertson, Epping: Brown Leghorns	114	76	68	121	148	148	139	111	100	97	86	48	1256	24½	108 11
21. P. J. Ahern, Arncliffe: White Leghorns	116	95	126	136	136	142	126	118	108	67	56	29	1255	26	107 1
22. T. A. Hutchinson, Curl Curl: Andalusians	53	115	116	120	120	131	135	147	100	87	84	47	1255	24½	108 11
23. N. B. Ralston, Fairfield: Silver Wyandottes	116	116	113	130	138	128	107	95	89	78	76	62	1248	24¼	111 5
24. J. Campbell, Sans Souci: Silver Wyandottes	102	87	93	125	104	112	113	122	108	93	100	80	1239	24	112 7
25. C. W. Bannister, Pyrmont: Black Orpingtons	24	67	115	129	143	143	115	116	113	92	102	74	1233	27	106 6
26. Bright and Thompson, Dul. H.: Br. Leghorns	58	97	111	110	137	149	140	128	126	96	70	6	1228	23¾	102 2
27. N. Day, Randwick: Black Orpingtons	67	56	134	154	149	137	117	122	79	76	76	45	1212	25	102 5
28. A. Robertson, Epping: White Leghorns	113	85	100	107	124	132	127	115	117	95	70	25	1210	25	104 7
29. D. W. Albone, Waterloo: Silver Wyandottes	89	58	126	132	131	122	123	101	100	67	87	67	1203	24	105 7
30. C. B. Hunt, Hurstville: Houdans	66	53	107	164	148	152	150	125	77	48	65	41	1196	26½	97 7
31. G. Whittaker, N. Botany: Black Orpingtons	79	101	138	135	132	125	113	110	80	66	77	38	1194	25½	103 4
32. D. Little, Brighton-le-Sands: Blk. Orpingtons	30	118	121	134	119	138	120	118	107	79	75	31	1190	24	101 10
33. Mrs. Blacklow, Kogarah: Black Orpingtons	133	102	134	115	110	97	93	119	88	73	71	44	1179	25	106 7
34. E. P. Gladwin, Singleton: Silver Wyandottes	104	118	117	127	119	119	112	96	76	68	63	58	1177	24	104 9
35. R. Rhodes, Botany: Minorcas	100	100	113	129	127	148	135	123	94	60	33	12	1174	28	97 2
36. Fuller Bros., Kiama: White Leghorns	60	77	111	126	124	132	129	133	108	75	54	24	1153	27½	95 10
37. H. G. McKittrick, Grafton: Silver Wyandottes	50	118	133	136	113	124	98	91	79	72	70	66	1150	22½	102 0
38. H. E. Upward, Wyong: Silver Wyandottes	38	120	117	134	130	114	105	105	81	81	80	36	1141	23	98 2
39. Mrs. Hindes, Gatton (Q.): Black Orpingtons	33	70	122	110	139	140	116	115	98	88	83	23	1137	24¾	94 10
40. H. G. Dennis, Thirlmere: Black Orpingtons	16	57	127	130	140	131	108	118	97	79	74	46	1133	26¼	93 9
41. F. Val Wikner, Grafton: Silver Wyandottes	36	46	108	126	132	143	114	117	139	114	46	2	1123	26¼	90 0
42. V. Morrin, Rockdale: R. C. Minorcas	66	80	110	128	124	132	125	115	88	68	48	32	1116	25½	93 4
43. F. P. Hobbs, Burwood: Silver Wyandottes	106	95	113	108	114	105	102	95	81	67	56	52	1094	25	97 3
44. M. Blanch, Petersham: White Leghorns	70	80	98	106	115	125	125	123	107	64	52	27	1092	25½	92 1
45. D. S. Gordon, Penrith: Black Orpingtons	93	96	108	118	122	119	104	91	80	60	52	44	1087	24¼	94 8
46. Mrs. Blacklow, Kogarah: White Leghorns	64	44	58	124	112	125	144	118	104	85	67	21	1066	24½	87 11
47. S. Wilson, Burwood: White Leghorns	126	84	97	122	117	125	106	79	81	66	39	21	1063	27½	91 2
48. W. Wynn, Hurstville: White Leghorns	68	47	63	105	138	164	146	119	99	36	28	29	1042	26¾	83 0
49. D. B. Bannister, Pymble: Black Orpingtons	84	86	81	112	114	105	113	90	68	53	75	47	1028	24¾	90 2
50. H. P. Keatinge, Newtown: Black Orpingtons	49	90	114	126	121	114	100	85	57	69	53	32	1010	25½	85 6
51. Mrs. A. A. Johnstone, Up. Bankstown: Silver Wyandottes.	32	92	126	125	120	102	94	82	68	55	51	46	993	24	84 11
52. Conroy and Doyle, Glenlee: White Leghorns	46	70	92	111	124	138	130	97	77	40	34	19	978	24½	78 9
53. R. R. Brown, Ashfield: Black Orpingtons	6	33	111	145	132	133	116	111	77	51	37	13	965	21½	74 3
54. W. C. Murray, St. Peters: White Wyandottes	23	27	34	93	116	118	113	102	92	88	82	33	921	25	76 5
55. E. Ahern, Arncliffe: Buff Orpingtons	74	62	117	89	110	107	87	83	65	45	42	20	901	23	76 1
56. C. H. B. Dagnall, Canterbury: Blk. Orpingtons	20	42	92	120	120	112	108	90	69	50	38	20	881	24¾	69 11
57. W. Jupe, Drummoyne: Silver Wyandottes	33	43	70	95	102	121	85	80	73	54	52	67	875	25½	75 6
58. W. F. Doyle, Werris Creek: Silver Wyandottes	27	40	81	103	111	104	94	65	76	63	59	30	853	24	71 0
59. Jones and Reid, Thornleigh: Buff Orpingtons	43	85	96	90	95	99	69	70	63	58	49	25	851	25½	73 5
60. W. T. Rooney, St. Peters: Langshans		33	66	132	126	122	116	84	49	30	16	..	774	25	56 0

Grand total for sixty pens for twelve months, 70,437 eggs. Average per pen of six birds, 1,173·95 eggs.

Conductor's Report.

"It is pleasing," writes Mr. McIntosh, "to have to report a very satisfactory year's work. Given favourable climatic conditions, I had hopes of improving my previous year's records, but although a large number of individual pens are ahead of last year's, the average of the whole flock is not up to my expectations. The principal cause of this was starting in May instead of April, as in the previous year. The low average of the last month, caused by the majority of the pens being in full moult, has clearly shown April to be the best month to start these competitions in this State. The number of entries in excess of the accommodation must have been very gratifying to the promoters, but I deemed it advisable not to have more than I could personally manage, consequently the number was limited to sixty.

"Shortly after arrival several pens were attacked with an illness similar to influenza in human beings, which, although no deaths resulted, completely stopped their laying for a time. The whole of the birds have been remarkably healthy throughout, and only five deaths have occurred, in addition to which about half a dozen became incapacitated from laying and had to be replaced.

"Animal food during the first few months was abnormally high in price, and was not fed in such liberal quantities as I should have liked. During the last six months skim milk was available. I found it a splendid food, which stimulates egg-production in a marked degree. It was used to moisten the mash, composed as follows:—Pollard, bran, and a small proportion of maize meal. Sometimes chaffed lucerne or white clover was mixed in the mash, but I used a less proportion of it than formerly in the winter months; or, rather, when eggs were bringing high prices. Sound wheat was given at night. The weight of-eggs column shows satisfactory figures, very few pens having failed to reach the regulation standard.

"During the half-dozen years laying competitions have been in vogue, the prices of food and quantities consumed have been published, and as they have varied considerably I deemed it unnecessary to incur the trouble of making out any such statement, but for the benefit of those who wish to make comparisons I may state the prices paid by me this last year were less than the period of the previous test.

"The market value of eggs, as shown, is the amount realised at auction or sold on commission by agents, the amount of commission being deducted."

It will be seen by the above that the feeding was of the simplest, with little variations, consisting of the usual bran, pollard, wheat, meat, a little maize meal, grit, green food, and milk. The following are the amounts paid for the various items, the green food and skim milk being the product of the farm, the cost is estimated:—Wheat, £39 15s.; pollard and bran, £35 8s.; maize meal, £9 12s.; meat, £8 10s.; grit, £4 5s.; green food and milk, £4. Total, £101 10s.

The eggs were marketed weekly, and for the month of May, 1906, averaged 1s. 5½d. a dozen; June, 1s. 5d.; July, 1s. 1d.; August, 9d.; September, 8d.; October, 8½d.; November, 9½d.; December, 11d.; January, 1s 1d.; February, 1s. 2½d.; March, 1s. 6½d.; April, 1s. 11d. The net amount received per month ranged from £19 19s. 10d. in April last up to £30 7s. 4d., the amount received in July last year. The lowest number of eggs produced by the 360 hens in any month was 2,447 in April last, the greatest number was 7,922 in October last year. The total amount received for eggs, less commission, was £301 11s. 6d., after which deducting the food bill left a clear profit of £200 to pay labour, &c.

Concerning the laying of the various breeds, as will be seen nothing can be determined. Averages certainly are useful when a large number are competing, but when there are but two or three pens of a sort, their performance is of small value, except as testimony to the merits of the individual

pens concerned. The laying, however, of several pens was remarkable. Buff Orpingtons have the reputation of being a very broody breed, and have hitherto done badly at laying tests, but at Rockdale a pen finished ahead of all the Orpingtons by laying the grand number of 1,345 eggs, or an average of 224 for each hen, and laid them when they were dear, for although finishing ninth in the competition they occupied fifth place for value, the eggs realising £6 1s. 8d. The latter big performers were bred from a pen which produced but 963 eggs at the 1904-5 Hawkesbury College test, thus showing that a comparatively poor strain can in a few years, by consistent selection be brought to record makers. Mr. C. J. Green, the owner, was responsible for the transformation. White Wyandottes, although reputed good layers, had

G. Pitman's Black Orpingtons.
1,325 eggs. 29¾ ounces to the dozen.

never previously done well in the laying tests in this State, the best being 1,161 eggs made by six Americans at the 1903-4 College test. At the competition now under review, one pen of these finished second with the extraordinary number of 1,444, a record for whites, and beaten by but three or four pens of any breed in any test; the fourth place was also taken by this breed with 1,400 eggs. The above lots were from a Sydney suburb and the Clarence River respectively, and were of the Hayes American strain, again showing that breeding for the purpose of improving laying can, if consistently carried out, be accomplished, irrespective of country or clime, the improvement by 250 eggs in three years being testimony to the skill of the breeders. Another pen of this breed laid but 921, and the same improvement can be brought about at the owner's desire.

White Leghorns are proverbially good layers; the lowest for this breed in this test was 1,042 eggs, while the extraordinary number of 1,473 was made by the winning pen, owned by Miss Kemmis. This number was a record for the breed at any competition, except the Gatton (Queensland) competition, the winning pen there laying 1,480. The pen at Rockdale had some remarkable features—although leading from the third month till the end they never won a monthly prize, their laying was consistent throughout, and failing only the last two weeks. The broken up appearance of the birds will be seen in the photograph. The six birds weighed between 23 and 24 lb, and laid 214 lb. weight of eggs—each hen thus producing about nine times her own weight. The remarkable results was the theme of much conversation amongst poultry men, all sorts of inquiries were made as to their pedigree, the assumption being that they must belong to some renowned strain; many rumours got afloat about them, one being that they were purchased for a few shillings in Paddy's Market. Miss Kemmis was appealed to on the point, and replied as follows:—" Six years ago I bought a trio of White Leghorns in the Queen Victoria Markets, and at the expense of considerable time, I have brought them to their present high standard. They never were in any previous competition." This again shows that fowls whether from the fanciers' yard or the dealers' coop, of unknown lineage, can, with due attention, be brought to the highest possible production. There were many other notable pens in the competition. Mr. Pitman's Black Orpingtons may be mentioned. These secured the highest place for blacks with 1,325 eggs; this owner's same strain at the previous Rockdale test only laid 1,043 eggs, the improvement of nearly 300 eggs in one year being an accomplishment hitherto unrecorded.

The increase in the number of eggs was, however, not all. At the previous Rockdale test the eggs weighed just the standard size—24 oz. to the dozen; but at the second test the eggs weighed 29¾ oz.

There is no need to go further on this subject, except to say that no matter where fowls are bred in the Commonwealth, most of them, if young, simply fed, and otherwise correctly managed will lay well, and the few strains that have not hitherto laid 200 eggs per hen can be easily brought to that standard.

Nearly every breed participated in the high numbers referred to, while wide apart districts of this State, Victoria, South Australia, and Fiji had all representative pens which produced 1,300 eggs or over within the year.

Elements of Success.

When the first Rockdale test was brought to a close there was much speculation as to what was responsible for the good results—feed, management, location, or aught else, and many thought the figures put up would never again be reached. This latter prediction, however, has been at fault, seeing they have been exceeded, the total production averaging 16½ dozens for each of the 360 hens, and the fact that this has been done twice on the same farm,

and in the same runs, warrants an extract from the *Gazette* of June, 1906, describing the simplicity of the place, plant, and management at Rockdale.

Rockdale is the name of the suburb in which the competition took place; but the actual location of the test-yards could be more appropriately named "Sand-vale," and is situated in an unpretentious roadway named James-street, off the tram-line to Brighton-le-Sands (Lady Robinson's Beach), between that seaside resort and the railway station. Prior to the arrival of the "Endeavour," the entire locality was, no doubt, one of the white sand flats with which the coast is studded. The settlement of the district soon found the flats adapted to the influence of the spade and hoe—market gardening and poultry breeding being the principal industry of the district—with the result that what was once acres of white sand and occasional swamp is now small but prosperous-looking farms and gardens, the continued application of organic matter converting these one-time white acres into sandy loam, this being now the nature of the ground where this competition was to take place.

Coming to the houses and runs. The book theory has been that the larger the runs the better, and when the extent of those at Rockdale were seen to be but 10 x 40 feet for six fowls, including house space, it is no wonder there were discussions, and detracting comparisons made with the 400 superficial feet of hot Rockdale sand, and the more favoured area of 1,479 feet of well-grassed runs at the College. The runs are, as stated, but 10 x 40 feet, enclosed with 6-foot wire-netting, the absence of male birds in the pen obviating the use of the orthodox 2-foot paling. The houses have what is known as the span-roof, but as the centre of each house forms the dividing line between two runs, each of these houses in reality forms two, resulting in each house being a lean-to. They are built of the ordinary tongued and grooved soft wood, half-inch lining boards, and from front to back are 4 feet, and 3 feet 9 inches across, opening for doorway being 1 foot 9 inches; but whatever the simplicity of construction for roosting and confinement, the furnishings were more so, and consist of a small box to hold grit. The water tin is the usual 2-quart galvanized kitchen dipper, minus a handle. The nest-boxes are insignificance itself, and consist of two strips of wood, 4 or 5 inches deep, and apparently 16 inches long. These are nailed together at the end, forming a half square, which when laid down on edge in a corner of the roosting house, near the door, forms a nest Nest egg none, and nesting material the merest fragment of hay.

The outfit and arrangements as has been seen were of the simplest and most inexpensive; the feeding, which is the most important thing to poultrymen, was simplicity itself, and consisted of the usual bran, pollard, green food, wheat, and maize meal. The pollard and bran were mixed each morning with boiled liver and its soup, no general rule was observed as to the quantity of food, each pen was given as much as the hens would pick up clean, and no more.

With the record figures put up two years in succession, from a not too select collection of fowls, a number of the competitors were consulted as to what they thought were the elements responsible for the success, the majority of them agreeing that the personal care and special attention to the requirements of the individual pens in the way of feeding, the correct quantities to each, was largely due the success—location having little to do in the matter.

Objects and Results.

The competitions, as previously stated, were brought about by a discussion on the laying properties of certain breeds, and for a time this question of breed *versus* strain was vigorously contested for in several papers. Advocates of breed usually selected Wyandottes as the best to keep for egg production.

This contention has now not only been modified, but abandoned, the now acknowledged object of the competitions being to stimulate and encourage

systematic breeding for the improvement of laying, and that they have done so has been testified to by the brilliant performances of many competing pens, which were the direct progeny of some that made but moderate laying in earlier tests.

However, there is no desire here to unduly laud the good these competitions have done, and it is but fair to mention that many pens of various breeds, which have competed at Hawkesbury, Rockdale, and Ryde, and in other States, have done excellent work by laying 1,200 eggs and over, neither they nor their ancestors having even a remote connection with a proved laying strain, nor the result of any selection by their owners.

Withal this, there is no doubt the excellent prize money offered at the various tests has prompted many breeders to lay out plans for capturing some of it, and were successful too. This enhances the value of their stock, as does the winning of a prize in the show pen, where such are offered for the colour of feathers, shape, and condition.

Acknowledging that the primary objects of these competitions was to increase this State's egg supply, whether such has been done or not is a moot question. We have been told that hundreds of people are now giving attention to this issue of the poultry industry, where but few did so before, yet we cannot get over the fact that every available record points to a lower annual production, the increased market value of the product confirming the other evidences of reduced supplies. Why this shortage is a question outside the region of this paper, and will form a more extended reference at a later period; suffice to say that despite all big money surpluses shown by the laying competitions, there has never been sufficient care taken to show that these amounts over the food bills are not all profit, indeed, very far from it, and I have personally known instances where poultry farms have been purchased on the above suppositions of so many pounds profit from the eggs of so many hens, with the well known sequel.

Briefly, poultry farming is a very laborious industry, excessive hours, seven days in the week, and not too pleasant business, and the profits not equal to those obtainable from the same amount of labour in many other industries.

The most unskilled labourer can now command two guineas for his forty-eight hours' week's work. The poultry-farmer gives nearly double that time to his industry, and while from his own labour may obtain from his fowls the above amount or so for some weeks, for many others in the year the returns are considerably less.

On this subject, "On the Land" wrote in the *Sydney Morning Herald*, of February 8th—

In the farm competitions the returns of the profits forwarded to the judges have been very interesting. . . . . . . Dairying generally, and particularly on the North Coast, was naturally a big money winner. Without doubt the poorest returns for the labour and capital expended were furnished by the poultry, which, although not a feature of the competition, was seriously prosecuted by a number of entrants. One or two competitors were buying feed for their birds, and their profits were miserable as contrasted with those of other farm pursuits. Where the feed was grown on the farm it was very

evident that to make £50 a year required a heap of skilled labour and considerable outlay. The same amount of feed and trouble bestowed on pigs would probably give much better results, and without the risks and disappointments associated with incubation and successful egg production.

The above emphasises all I have said. Other issues of the farm show bigger profits, with less risks and disappointments, at the same time a certain number of fowls can be profitably kept on most agricultural farms, but when the numbers are such as to involve the purchasing of food and the employment of labour, then, as "On the Land" says, the profits are miserable.

Coming back to the laying tests and the results, it has to be remembered that very many of the competitors were not poultry men in the strict sense of the word, but tradesmen, others in business in the city, professional or other occupations, who kept a few fowls for the supply of eggs for the household, or the profits from them as an auxiliary to their other business; the chief object in competing being their chance of winning one or other of the many prizes, and in some instances when they did and business followed, the stock to fill the orders had to be purchased at the auction sales, or elsewhere. Others when they failed to win were not again heard of in the poultry business, while a considerable number of the earlier competitors have abandoned keeping fowls. The laying competitions have been the means of bringing a good deal of trade to this State from the other portions of the Commonwealth, some of the most successful ones acknowledging doing more business beyond the State than in it, and, if the claim here is correct, that the competitions have been the means of increasing our supplies, then in South Australia, where numbers of our stock were sent to, the supplies will become larger there also, and come back here in increased imports from that State.

The appended table shows the immensity of our egg imports, all of which testifies that for very many years to come our own egg production will not meet the requirements of the people, this feature guaranteeing us a continuance of the excellent markets at our own doors.

Egg Imports for the Past Four Years.

EGG IMPORTS TO NEW SOUTH WALES.

Whence—	1903.		1904.		1905.		1906	
	doz.	£	doz.	£	doz.	£	doz.	£
Victoria	17,248	832	22,718	761	42,606	1,128	31,874	1,062
Queensland ..	66,571	2,964	216,363	5,912	293,364	7,117	125,988	4,196
South Australia ..	726,225	34,014	1,016,218	35,077	1,101,478	29,108	934,132	33,611

The above detailed four years' imports show that, although the quantities in dozens were reduced last year, the value of the imports exceeded that of 1905 by over £1,500, and in addition there were over 15,000 dozens imported from New Zealand and other countries, clearly showing that if egg-laying competitions tend to increase production, we want very many more of them.

Flax.

[Continued from page 431.]

J. LINTOTT TAYLOR.

PRESUMING that the grower has sown his linseed according to directions given previously, little remains to be done to the growing crop except now and then a visit of inspection, and a walk up and down the drills, to remove any rankly-growing weeds and observe the progressive condition of the crop.

Flax is an evenly-growing crop, and the young plants soon make headway, and leaves quickly spring from the stem as closely as half an inch apart. The writer has before him two samples of this season's growth. The Riga was sown on 1st April. Including roots is 4½ inches long, 1¾ inches above ground, and has upon the stem sixteen leaves, five weeks from sowing. The other is the Belgium, sown on 15th April. This variety seems to have a more vigorous growth, for it is 6 inches long including roots and 4 inches above ground, and has twenty-two tiny leaves, three weeks from sowing. These leaves spring out on alternate sides of the stem until the flax is full grown and then die off, leaving the ripened stem quite clean with only the seed boles at the top.

The plant generally appears above ground eight or nine days after sowing, under favourable conditions.

The samples referred to are looking strong and healthy, though they have had no rain or moisture in any way worth considering, showing that the flax plant does not need so much moisture as is generally supposed.

Passing on through the season we come to a time when we want to ascertain whether the crop is ready for cutting.

Much seed will be lost if cut too late—again, it will be liable to pinch and shrivel if cut too early. There are two fair indications of readiness for cutting. First, the leaves will have fallen or will fall at the slightest touch and leave the stem clean and bare; and secondly, the boles will begin to assume a light-brownish colour. It will be well to sample a few boles, and if the seed is well filled out, a good brown colour and glossy surface, and free in the boles, it will be time to begin to gather the harvest. Naturally the farmer will cut first the part he considers ripest.

Hand-pulling may be all very well for some parts in the old world, but it would be absurd to hand-pull flax in Australia. No advantage is gained by so doing, since the dried roots are as brittle as glass and contain not a trace of fibre. By leaving them in the ground they will decay in due course and to a certain extent replenish the soil for a succession crop.

If the flax has grown to the height of 2 feet 6 inches and upwards a reaper and binder machine is the best to employ. As in all probability the flax will

pay for threshing, make the sheaves as small as possible and tie as tightly as can be done. This is a most important item to remember, since large sheaves cannot be properly threshed, the seeds in the middle escaping the required pressure to burst them open. Again, the sheaves, however tightly tied, will naturally shrink and so become loose and probably fall to pieces. Therefore, cut small sheaves and tie very tightly. Another point to remember is to cut the crop as near to the ground as can safely be done. The fibre goes down to the soil, not lower, and the strongest part of the fibre is near the root—hence the importance of cutting low and having the ground well rolled without lumps or stones.

The writer having to meet very strong growths of weeds and somewhat uneven soil used a back delivery reaping and mowing machine. This process is not so satisfactory as a reaper and binder, because the sheaves were of uneven size, not tightly bound, and much more labour with increased outlay had to be employed. After cutting and binding the sheaves must be stood up to make stooks for a further ripening process. Weather will not injure the crop any more, if so much, as wheat or oats, but it is well to mention that birds, horses, sheep, cattle, of all sorts and conditions, are very partial to linseed. Therefore, when quite dry it will be as well to cart to the stack. The seeds will be heard to rattle in the boles, denoting the ripeness of the linseed.

Handle carefully so as to lose no seeds, for the boles, while not naturally breaking and losing the seed, are easily broken off the parent stem and so lost. In stacking lay the sheaves evenly side by side, so as to make it easier to remove when they come to be threshed. As mice are equally fond of the seed with everything else, it will be well to thresh as soon as possible or considerable loss will ensue.

The threshing is an easy process. Two rollers revolving towards each other and set to draw down the sheaf are driven by a 5 or 6 horse-power engine—a less power will answer very well if the sheaves are small. The sheaf is placed on the top and drawn downwards by the rollers, and the heads only pass between the rollers—the result being the instantaneous crushing of the boles which liberates the seed. This falls on to a tray or cloth and is passed on to the winnower, where it is cleaned and graded and at the same time bagged.

The sheaves still securely tied are handed on to build another stack, which can remain indefinitely in point of time, nothing injuring the straw.

In passing it may be worth inquiring if there is a demand for the seed at our doors. Of course, the supply is too limited to warrant an outlay to any large extent in erecting crushing works to produce the linseed oil—so important in many ways, artistic and necessary; but that there is a demand is well known, and why that demand has not been met by local linseed growers remains to be explained. To test the market the writer entered into a correspondence with the well known firm of Messrs. Lever Brothers, at their Sydney depôt, asking if they could take some 3 tons of seed he has for sale, and this is the reply to the first letter:—"We are afraid that unless we could get

sufficient seed crushing could not be very successful, and 100 bushels would be a very small quantity. . . . . We would be obliged if you would favour us with further particulars as to the total quantity you would have to dispose of periodically."

The next letter brought the following reply:—"We are afraid that the quantity of seed which we could collect in the Commonwealth would be so small that it would not warrant getting a special plant for dealing with it. Our idea of a payable quantity is somewhere about 100 tons of seed per annum."

These two letters, from so excellent a firm, show that there is a market waiting for all the linseed that can be grown in New South Wales, and last month the extracts from the letters of Messrs. J. Miller & Co., of Melbourne, proved there was a waiting market for any quantity of fibre. These statements dispose entirely of the cry, "There is no market for linseed or flax."

We now come to the more important matter of treating the flax straw into fibre. This process is termed "retting," and may be considered the most difficult and also important operation to learn. There is nothing mechanical in the process, but all depends on observation and experience. Retting, or rotting, is the destroying of the gum in the stem which binds together the fibres and straw, *i.e.*, the woody and worthless part of the plant. This process if carried too far will cause a decay so as to affect the quality of the fibre, hence the need of observation. Fibre that is weak and almost useless in the ripe state becomes strong and valuable after retting. The method employed in the old countries of Europe is to procure this change by immersion in large pits or tanks of water, or in slowly running streams. This process is disagreeable in the extreme. This old method has been superseded by the cleaner, cheaper—costing about 15s. per acre—and equally good way of getting the fibre, by dew retting, *i.e.*, the chemical change in the fibre and the de-gumming or separating the straw from the fibre is brought about by the action of the weather on the flax. The sun, rain, wind, dew, and even the moisture from the earth, produces the same results as obtained by the old way. Dew retting as it is termed occupies a longer time, generally from four to six weeks—at the same time no expense is incurred beyond supervision. However, to be fully successful in this most important part of the business, experience is especially needed. It is well, therefore, for a small grower, say of up to 50 acres, to dispose of his straw and seed if a central buyer is found. If not, and he cannot afford to obtain an experienced man to assist him he can easily learn to treat his crop by diligent observation and often testing his flax. It is well known that retting strengthens and toughens the fibre, and when fully retted the straw turns to an ashen-grey colour and easily breaks, leaving the fibre free. To explain the method. Lay the sheaves already threshed on a grassed ground if possible, cut or untie the binder twine, and spread the sheaf out in a close, even manner. Do this with as many as is intended to use in a row. Then repeat the action in another row, till at last the field will be fairly well covered with rows of flax as hay is laid in wind rows in a hay-field, leaving room to walk between the rows. These so laid may be safely left, for nothing will eat the tough straw. At the same time cattle, sheep, &c., will soon spoil

the crop, so if possible a securely fenced paddock should be used. In case of continued and heavy winds a sapling pole, or a rope tied securely from end to end, and pegged down in places, will prevent any being blown away. After about three weeks or less, according to climatic changes and the state of the fibre, the flax can be turned. This is done by passing a long light stick, of some 8 or 9 feet in length, under the heads of the flax straw and lifting it gently and letting it fall with the exposed face downwards and that which has been under is now on top. Frequently test the straw to see how it is maturing or retting. The turn over having been effected, let it remain another three weeks or less according to circumstances. This is all the retting process, and the time of year best suited may differ in different localities, but early spring or autumn, with their heavier moisture in the way of dews, will be found best. Summer is too dry, and often winter is too wet.

After having been carefully retted the flax is raked as evenly as possible together, tied in bundles, and conveyed to the stack. Never let heads and tails get mixed, or the next process will not be so satisfactory. Stack carefully either in a shed or in the open, and, with a sound covering or thatch, the straw in this state will keep good for years.

(*To be continued.*)

The Influence of Bees on Crops.

[Continued from page 437.]

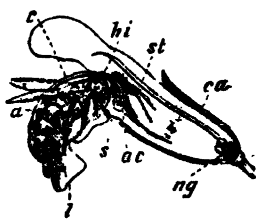
ALBERT GALE.

Let us enter into one of the temples of Nature and have a look at the matrimonial instincts of plant life. How their ceremonies are conducted; how species and families of plants live and perpetuate; who are the conjugating and officiating priests, and how the contracting parties faithfully carry out their marriage vow of for better or for worse, only when Nature performs these ceremonies it is all better and no worse; especially is it so when man has taken in hand the higher development of certain varieties of plant life to be more adapted to his wants and needs.

In the higher members of the plant-world there is a very great difference between pollen cells and the ovules (little eggs) that are joined to form new individuals. The former of these is smaller than the latter, and more active—it is the male; and the latter, of course, is larger than the former, is composed of richer matter, and is passive—it is the female. From the nature of these ovules, these passive eggs, they cannot become seed or plants until they are united with and fertilised by an active or live pollen grain. The essential organs in blossoms known as anthers contain these active cells, the cells of life. The pistillate organs contain the passive cells, the cells of matter. The pistil in apples, pears, or other fruit blossoms is the bride, the stamens seen in blooms of like trees are the bridegrooms, and the honey-bee is the licensed officiating priest who is to perform the connubial ceremony. Let us for a while watch these officials of Nature carry out some of their highly important duties. Bearing in mind, whilst so watching, the table of kindred and affinity wherein it is stated a man may not marry his grandmother or a woman her grandfather, &c., and note how these insects, without a written law, are never parties to close or blood relations intermarrying; neither does their natural instinct permit them to perform unnatural alliances. They will not attempt to marry an orange to an apple, or a pea with a pumpkin, or a pear with a cherry, and so on; neither does Nature permit them to marry the male of a blossom with a female of the same bloom. Such alliances in the higher plants are repugnant to all concerned. Nature's motto in the vegetable kingdom, as well as in the animal, is, especially when aided by the intelligent hand of man, "upward and onward." If the pollen of a blossom were transmitted to the carpels of the same, the result would be degradation, and the loss of some of the choicest varieties of fruit and vegetables we now raise from seed.

The ovary is composed of one or more carpels. The ovary of an apple bloom has five such carpels. In the mature fruit these are termed the core.

In the early spring mornings, when the bees issue forth to go in quest of stores, the first thing they gather is pollen. It is the first product the blossom yields, even before it secretes its nectar (honey). In their eagerness to be first on the foraging ground, they leave home at about sunrise. If they have selected an orange to gather their stores from, they will keep upon orange or some other member of the citrus tribe during the whole of that peregrination. Tumbling about in the cup of the flower amongst the anthers, they gather up in their fur numberless grains of these life cells, pollen grains. Head, thorax, abdomen are all more or less dusted with it. Whilst gathering it, and whilst on the wing from flower to flower, and tree to tree, they are busily engaged in packing it in the pollen baskets that are situated in the upper part of the hinder legs. As the day warms, the blossoms unfurl; the central whorls develop, and the stigma becomes receptive. The bee, eager in her duties to supply her home with abundance of food, both for the young brood and winter storage, commences her search for honey. In the early morning there is little or no nectar secreted; but as the warmth increases so the flow of honey advances. Anxious to fill her honey-sac whilst gathering the pollen she enters the blossoms where she will find the greatest abundance of her favourite winter storage, and thrusts her tongue down into the nectaries of the blooms. To get at the honey more readily she lies on the top of the essential organs, and brushes to and fro on the stigma. Whilst thus engaged, the fur on the various parts of her body retains pollen grain; those on her breast come in contact with the stigmas of the flowers. Having commenced working on an orange for pollen she will not go to an apple or aught else for her honey. Citrus fruits supplied the pollen, citrus fruits must provide the honey. Why? Because Nature has endowed the bee with that intelligence—there is no other word so applicable—to know if she were to take the pollen of an orange to the stigma of an apple, as far as fructification was concerned, her labour would be useless. Pollen from one species of the vegetable kingdom can seldom be used successfully, even by artificial means, to fertilise that of another species. When it is successful the result is a hybrid, the descendants of which cannot be perpetuated by seed, but only by cuttings, graftings, &c. Bearing in mind the characteristics of the stigma, its adhesiveness, and its hairy hooklets, the bee's breast, coming in contact with the latter, it acts as a comb or brush, and aids in detaching the pollen grains from the fur of the bee. These grains fall on the adhesive stigma, and are retained by its viscidity. When this contact takes place—sometimes at once, at other times it may be delayed for hours—the cell of life starts into activity by throwing out a pollen tube, which at once goes in search of the cell of matter contained in the passive ovule. To



Bee in the act of fertilising.

a Anther cell.
ac Aborted cell.
c Connective.
hi Hinge of Filament.
ca Calyx.
st Style.
l Labium.
ng Nectar gland.
s Stiff attachment of filament

accomplish this the pollen-tube makes its way down the style which connects the stigma to the ovary. The silky threads that protrude from a cob of corn, delicate as they are, are not too fine or too long for these active tubes to penetrate. The style of the orange, &c., is also as easily pierced. The ovule, or young seed in the ovary, contains the embryo of the future plant. The pollen-tube having found its way to the ovule, the union of the respective cells takes place. The ovule thus receiving the "germ of life," the infantile development of the future orange or other tree, as the case may be, commences.

When the contact of the two cells has been accomplished, the calyx withers; the corolla, with the dead remains of the stamens adhering thereto, falls to the ground; and the pistil in most cases is absorbed in the fruit.

These developments will be better understood by reference to a peach or other stone fruit. When the ovule has thus been fertilised, the seed, or, as it is generally termed, the kernel, is the first to develop, followed by that of the hard shell surrounding it, the stone. At first both kernel and the shell of the stone are in embryo; as they advance in age the shell hardens, and, at the same time the flesh increases and matures with the gradual expansion of the outer skin. We then say it is ripe, *i.e.*, its flesh has become useful as food to man, and the seed capable of reproducing its species.

Now, it must be obvious to the most casual reader that the bee has played the imperative part in the production of these fruits. Nothing else could have accomplished it so effectively and with such beneficial results as the little busy bee. Other insects live on honey and pollen, but no other insect is endowed with the instincts of social bees. Bees work so systematically in cross-pollenisation. They make no mistakes. They will carry pollen from variety to variety, and sometimes from species to species, but not from order to order. After a foraging excursion they are never seen to return to the hive with different varieties of pollen on their bodies. In examining a cell of pollen in the hive, each stratum is seen to belong to distinct species of the vegetable kingdom (not varieties). With other insects that only feed on pollen grains, they consume it on the anther whereon they alight. It is for immediate consumption for each one's present wants. Where other insects visit one blossom, bees will visit a hundred. Watch a butterfly on a flower and compare its actions with the rapid movements of a bee, and judge for yourself which is the better worker of the two. You must bear in mind that in early spring, flowers, and especially fruit blossoms, mature rapidly. Of the essential organs the anthers in most cases come to perfection first, and are the first to die. The pollen is distributed in a very few hours, and its vitality in most instances is short-lived. The pistil with stigma and its carpels are very delicate organisms, therefore liable to all kinds of accidents. When we remember the chief characteristics of the stigma, it will be seen that a dust storm is capable of clogging it, and thus prevent fructification. A dust storm in early spring has a deal to answer for in the failure of fruit crops; so has heavy rain, wind, or anything else that may bruise these very

delicate portions of the flower. From this will be seen the imperative necessity for some rapidly-moving agent to convey the perishable pollen to the highly-sensitive stigma. The numerical strength of these agents must be in proportion to the quantity of work they are expected to do, or the areas under fruit culture they are to visit. If bee-keepers and their bees were banished from Australia there would be fruit, but in what quantities? I have referred elsewhere to the mischief done by butterflies and some other insects, but no such mischief ever follows in the wake of the bee. Fertilisation by agents other than bees would be sufficient to perpetuate species of fruits, and occasionally to produce varieties; but to fertilise heavy crops sufficient to feed mankind they are too inactive, and the mature insects numerically too weak. If adult butterflies, &c., were equal in number to adult bees a famine would follow in the track of their larvæ as disastrous as that caused by the armies of locusts that have been known to sweep over the Holy Land in times past. Numerous insectivorous birds and other animals almost live exclusively on insects, their eggs and larvæ, and thus their injurious ravages are somewhat checked.

How wonderfully has Nature protected this invaluable insect, the bee—valuable not as a honey-storer, but as a fruit-producer. Practically the adult bee has no enemy, if we except the wood swallow, and in the egg and larval stages its home is almost impregnable to invaders. Of course, like the human family and other animals, it is liable to the "ills that flesh is heir to." In a state of nature bee ova and larva have one arch enemy—the bee moth—and it is as well it should be so. Bees in a state of nature are a great drawback to bee-keepers. The honey, when obtained, is of a fourth-rate quality owing to the quantity of foreign matter mixed through it. That same honey, if stored in the frames of the hives of practical bee-keepers, would be worth four times as much as when obtained as bush honey. But this is a digression. To the careful bee-keeper, enemies, not diseases, to the eggs, larva, and young bees are rarely known. The bee-keeper having his stock under control can, with the greatest ease, regulate the supply and demand.

No district can be overstocked with bees, if we regard them as fruit-fertilisers only, but as honey-gatherers it is another matter. The greater number of bees kept in an orchard or fruit district the more rapidly is fertilisation carried on. Once the bee has carried the pollen to the pistil, the act of fructification being successful, the development of the fruit is assured—the fruit has *set*. A few days after the bloom of the trees has disappeared the infant fruit can be seen in the early stages of growth. Standing near an apple, orange, or other tree when the fruit is in its earliest stage, and a gentle wind shakes the branches, you will sometimes hear the fruit falling in hundreds, or if the tree is shaken the same results will follow. In walking through an orchard in spring-time young fruit just formed are always seen in greater or less numbers scattered on the ground. The premature falling of these fruits is, generally, the result of imperfect fertilisation, caused either

by slight injuries to the stigma or an insufficient number of bees to discharge the duties Nature requires of them, *i.e.*, fructification. The same results will follow if the blossoms after pollenisation are frost-bitten, or cutting winds, or the conditions of the growth or its development checked. All these and others will prevent the young fruit progressing to maturity. Sometimes the crop of fruit will be too heavy for the tree to carry, *i.e.*, the sap is insufficient to supply the young with the nourishment required.

Artificial Fertilisation.

"What man has done man can do," is a very wise old saw, or a truism that cannot be disputed; and what insects have done, in many instances man can do to his advantage and the advantage of his race. These tiny workers are accredited with unfolding and throwing light upon many a discovery, and man is said to have received some valuable and useful hints by noting the methods or the results of some of their habits and constructions. Science is said to have taught us that insects have played no inconsiderable part in the development of the plant world; how the ocean was the birthplace and cradle of vegetable life, or how the early aquatic forms of it developed their terrestrial representatives, and these again from the lower forms of fruit and grain to the highest types we now enjoy. Whether it was by those disputable points "spontaneous generation" or evolution from "mere specks of green jelly" seen floating in the sea, and the variations, ensuing from their battling and struggling for life, and the "survival of the fittest," or the ones naturally selected and taken by man under his care and guardianship, matters not, as far as the power we now have in producing variations in the vegetable kingdom, and from these selecting the ones that will administer most to our medicinal and dietary wants, or those having ornamental colours and forms to please the eye and decorate our surroundings, making life worth living, is immaterial to this portion of our subject.

That the bee is, by the part she plays in fertilisation, our greatest fruit-producer, must be conceded by those who have looked into the subject, and she is such an absolute adjunct to the orchardist and others, that to interfere with the bee-keeper would be suicidal to all who are engaged in the reproduction of vegetable life.

I have mentioned that bees have been accredited with the destruction of some of our choicest annual vegetables by inoculation, and that, to a certain extent, they are guilty; but the want of knowledge in men who are engaged in the work of supplying or cultivating such vegetables is the true cause of the disappearance or injury to the varieties referred to. I have said the inoculation of annuals, for it is immaterial how the fruits and seeds of trees and such-like that are reproduced by grafting, budding, cuttings, offsets, &c., are inoculated or cross-pollenised, because the immediate fruit or flower is in no way improved or injured by it. Cross-pollenisation does not show itself in the fruit or flower that has been so fertilised, but in the plant that is produced from that cross-pollenisation. You can discern an egg that has

been laid by a Cochin hen that is running in a yard of mixed fowls by its colour, but from the egg you cannot tell what the cross-bred chick will be; that will only show itself in the progeny resulting from the crossing. So it is in cross-pollenisation—the blossom or fruit does not show it, but the crossing is seen in the succeeding generation.

The way bees transfer the pollen grains from the anther to the stigma has been already described, and the simplicity of the method must be apparent to all.

The action of conveying it from place to place is in no way injurious, neither does the instrument used interfere with its vitality. An artificial instrument is as useful to convey it from flower to flower as a natural one, and the action would produce the same result. We have seen that pollen removed from the male flower and placed on the receptive organ of a female flower produce fertile fruit. In members of the pumpkin family the sexual flowers are situated on different parts of the same plant, and the sexuality of the blossom is very readily distinguished. Taking that class of plant for our model, let us see how easily artificial fertilisation can be accomplished. The first step will be to secure in both sexual flowers immunity from visits of bees and other insects. To do this, if the same strain of pumpkin, &c., is to be retained, select two blossoms (male and female) on the same vine whilst in bud form—that is, some days before the flower opens. Enclose them with fine mosquito netting. Gauze-wire is better, because it cannot come into close contact with the opening flower. Care must be taken that the netting is sufficiently large to permit the full expansion of the flower. When the essential organs are mature—that is, in the case of the male flower, when the pollen comes away freely with the instrument used in its removal; and in the female when the central organ has a viscid appearance—remove the net covering from the male bloom first, and with a soft downy feather, or, better still, a small camel-hair pencil (brush), gently brush over the essential organ. If the instrument used be dark in colour it will be noted that a quantity of yellow dust (pollen) is adhering to it. Carry the brush gently to the female flower, remove its covering also, and softly apply the brush with its pollen to its central organ. As soon as the operation is completed be sure to re-cover the bloom that has been artificially fertilised. To ensure male and female bloom maturing at the same time it is necessary that male buds in various stages of development be selected and treated as above described.

The imperative necessity of artificially fertilising cucumbers, &c., or fruits that are grown under glass or indoor gardens, has long been recognised. In colder latitudes, where early cucumbers, melons, &c., are at a premium, the first morning duty of the man in charge is, as soon as the sun is sufficiently high, to go the rounds of his forcing-pits to overhaul the vines therein, note every female blossom, and taking a male flower in his hand, dust the pollen from it to the stigma of the receptive bloom. Every stigma so treated is morally certain to produce a fruit. But every one neglected is certain to be a failure as far as the production of a fruit is concerned.

What has been said in relation to pumpkin-fertilisation holds good with every other flower that is fertilised by insect agency, only the smaller the flower the greater care must be exercised, and the more patience necessary to ensure successful results. One fact must always be remembered—every seed requires a grain of pollen to ensure a plant from the seed sown; therefore be not parsimonious in the application of pollen, and also remember "enough is as good as a feast." The care necessary is to apply the brush with its pollen to the receptive organ with as soft and gentle touch as possible.

When hybridisation or cross-fertilisation is required, the same methods must be followed as in the case of pollenising from one variety to that of the same; only whatever species or varieties it is proposed to cross for the production of something new, the selection of the sexes, *i.e.*, the stameniferous and pistilliferous, must be free from disease, vegetable blights, or parasites of every kind. The pollen from the anther must be removed from the one species or variety to the stigmatic portion of the one it is desired to hybridise, and *vice versâ*. Nevertheless the results from these crossings are often more successful than where this interchange is not used. The constitution in the sexes of two plants greatly differ: the pollen-bearing essential organs in one plant being far more vigorous than in that of another; and the same differences are met with in the receptive organs of distinct species or varieties.

If hermaphrodite or bisexual blooms are to receive cross-pollenisation, they too must be guarded from the action of insects. The operation is a very delicate one. The flower-buds selected from which to transfer the pollen must be carefully watched, and as the anthers develop they must be lightly removed without injuring the stigma in the slightest degree, a finely-pointed pair of scissors being used for the purpose. Stamens, as a rule, develop earlier than the pistil.

The pollenisation of double flowers or blossoms is another delicate work, and needs extra patience. The extra number of petals in these is the result of abnormal treatment, which causes the stamens or pistil, and sometimes both, to fall back to flattened leaves.

Botanically speaking, all flowers are modified leaves. When the stamens only have undergone this transformation it is possible to obtain seeds from double blossoms. The petals are removed in the same manner as the anthers from bisexual flowers, and the result is often effective, *i.e.*, fertile seeds are produced. Of course, the anthers from a single or semi-double flower supply the pollen; but where both stamens and pistil have undergone the transformation to petals, perpetuation by seeds is altogether out of the question. The reason is very patent—there are no organs of reproduction.

It will need a deal of patience and experience to be successful in the more delicate operations named, and the results will be very disappointing, for, as a rule, not one seed in a thousand or more will be an improvement on the original. Now-a-days the plant world has a tendency to go back to some earlier form.

These final remarks do not apply to the cultivation of pumpkins, melons, cucumbers, &c. The method of artificial fertilisation described will always ensure the best strains of them pure for years to come. To keep any choice strain in health and good heart, a pollen-bearing bloom of the same strain should occasionally be introduced from another district; a plant or seed would be better if the desired strain had also been secured by artificial means. Such plants should be grown away from the main crop, and the anthers and pistils used for reproductive purposes carefully guarded from any chance of the pollen from an undesirable strain being conveyed to the stigma of the plants to be used for seed purposes.

The pollen in all cases contains the cells of life, and the ovaries in the pistillate blooms contain the cells of matter. It is the union of these two cells, that of life and that of matter, which produces fertile seeds.

Remember, in selecting for cross-pollenisation purposes, natural orders cannot be used to produce new or fresh orders; nor genus with genus to produce new genera. Species with species will sometimes produce hybrids, but the result is that these mules are seldom capable of being reproduced from seeds, and when such is the case, they die out after one or two generations of sickly vitality. Nevertheless, hybrids so produced can be perpetuated by grafting, budding, &c. Hybrid annual seedlings seldom last for more than one season. Nature has always a tendency to revert to the original form from whence it sprung. In the ages gone by, whatever may have been the natural law as it regards the "development of species," the law now, in these later times, appears to have been repealed, not only in that of species, but even largely in that of varieties. Hybrids and varieties, both in the vegetable and animal kingdom, when removed from the fostering care of man, degenerate gradually but surely to the prototypes from whence they came.

I notice that I have used the terms "natural orders" to produce new orders, "genus" to produce genera, &c.; this may not be equally clear to all readers. But let us take an illustration from every-day poultry-yard life. Everyone engaged in it knows it is utterly impossible to obtain a hybrid between a duck and a fowl; while a hybrid between a Muscovy and an Aylesbury, or a Pekin duck, are of frequent occurrence, but these mules so produced are never reproductive amongst themselves, because the Aylesbury is a different species to that of the Muscovy. Again, if an Aylesbury duck be crossed with a Rouen, the cross-bred descendants are as productive among themselves as their parents would be among members of their own family because they are varieties of the same species. These same rules apply equally well to members of the plant world.

(To be continued.)

Judging of the Competitive Wheat Samples.

ROYAL AGRICULTURAL SOCIETY'S SHOW—EASTER, 1907.

F. B. GUTHRIE.

As in previous years the judging was based on the actual behaviour of the samples when milled in the model mill of the Department of Agriculture. In addition, an exhibit was prepared in the Farm Produce Pavilion, in which the competing samples were shown, cards being attached to each bag, showing the results obtained by the actual milling of the wheat, and of the testing of the flour obtained. Samples of the mill-products—bran, pollard, and flour—were also shown alongside the wheats, so that each competitor, or anyone interested in the subject, could not only see the reasons which influenced the judges in forming their decision, but also the actual results obtained on milling the individual samples.

The classes were four in number:—

Class 706 for macaroni wheats.
,, 707 for hard or strong flour wheats.
Class 708 for medium hard wheats.
,, 709 for soft or weak flour wheats.

A first prize of £7 and a second of £3 was awarded in each class, and a Champion Prize of £3 3s. for the best bag of wheat exhibited in any class.

The judging was entrusted to Messrs. R. W. Harris, head miller, Gillespie Bros., Anchor Mills, Sydney, and F. B. Guthrie, Chemist, Department of Agriculture.

The actual milling of the samples was carried out by Mr. G. W. Norris, on the small model mill in the laboratory of the Department of Agriculture.

The following is a copy of the judges' report:—

The Secretary, Royal Agricultural Society,—

Dear Sir,

The following are the details of the method adopted in judging the samples of wheat competing for the Champion Prizes. A preliminary inspection was made of the samples in the various classes, and the bushel-weights of all samples taken. These are given separately below. This preliminary inspection served to eliminate those which were of inferior quality or outclassed, or for any other reason ineligible for a prize.

The best wheats in each class were milled, and marks assigned to each in accordance with the results obtained in the mill, and these are presented in a tabulated form in their order of merit in each class.

As the samples were not received until 15th March (eleven days before the results were required), it was only possible to mill a few samples in each class; but these were sufficient in number to determine the milling nature of the prize-winners.

In the table, the figures in brackets represent the numbers obtained on milling the samples, the other figures being the marks assigned.

It must be understood that the marks are assigned only as between wheats in the same class. Thus in class 707, for example, 15 marks (full) are assigned to a wheat weighing 63¼ lb., whereas in class 708 a wheat going 64¾ lb. per bushel only receives 13 marks.

The milling of all samples was done by Mr. G. W. Norris, to whom our best thanks are due.

The wheats as a class are good exhibits, being nice attractive samples of clean grain. There is a decided improvement in the macaroni and hard red wheat classes over last year's exhibits. In the soft-wheat class the grain though of very good appearance, and often of high bushel-weight, is deficient in gluten, and the first prize in this class goes to a wheat which is very low in gluten.

Weights per Bushel.

Class 706 (Macaroni Wheats).

Catalogue No.	lb.	Catalogue No.	lb.
3919	62½	3921	65½
3920	63	3922	65¼

Class 707 (Hard or strong flour Wheats).

Catalogue No.	lb.	Catalogue No.	lb.
3923	63	3927	63
3924	61¼	3928	63
3925	outclassed.	3929	63¼

Class 708 (Medium class).

Catalogue No.	lb.	Catalogue No.	lb.
3930	65¼	3935	65
3931	61¼	3936	66¼
3932	65½	3937	64¾
3933	64¼	3938	65
3934	65	3939	64¾

Class 709 (Soft or weak flour Wheats).

Catalogue No.	lb.	Catalogue No.	lb.
3940	66¼	3947	64¾
3941	63½	3948	65¼
3942	65¾	3949	65¾
3943	64½	3950	64¼
3944	64½	3951	64¾
3945	64	3952	67
3946	64½		

Results of Milling Tests.

	Appearance of Grain.	Weight per Bushel.	Ease of Milling.	Percentage of Flour.	Colour of Flour.	Percentage of dry Gluten.	Strength.	Total.
Maximum Marks.	15	15	10	10	10	20	20	100
				Class 706 (Macaroni).				
Catalogue No.								
3919	15	14 [62½]	10	10 [72·5]	10	20 [14·5]	20 [55]	99
3920	12	15 [63]	10	9 [69·2]	8	16 [10·82]	16 [49]	86
				Class 707 (Hard Wheats).				
3929	15	15 [63¼]	10	9 [68·3]	10	20 [13·0]	20 [52·5]	99
3927	15	14 [63]	10	10 [70]	8	19 [12·79]	19 [52]	95
				Class 708 (Medium).				
3936	15	15 [66¼]	10	10 [73·2]	10	20 [10·0]	19 [52]	99
3931	13	12 [64¼]	10	9 [71·8]	10	19 [9·41]	20 [52·5]	93
3932	13	14 [65½]	10	9 [71·6]	8	17 [8·02]	19 [52]	90
3937	14	13 [64¾]	10	8 [69·1]	7	19 [9·65]	16 [49·4]	87
				Class 709 (Soft).				
3952	15	15 [67]	10	9 [70·8]	10	18 [7·14]	20 [48.5]	97
3940	14	14 [66¼]	10	10 [72·3]	8	20 [9·45]	19 [47·8]	95
3949	13	13 [65¾]	10	10 [72·2]	9	18 [7·40]	20 [48·5]	93

Awards.

Class 706. (Macaroni.)	First prize, No. 3919, Chaffey Bros. Second prize, No. 3920, Graham Bros.
Class 707. (Hard wheats.)	First prize, No. 3929, W. G. Reinhard. Second prize, No. 3927, D. McMillan.
Class 708. (Medium.)	First prize, No. 3936, H. Souden. Second prize, No. 3931, Clarence Dowe.
Class 709. (Soft wheats.)	First prize, No. 3952, Dennis Woods. Second prize, No. 3940, Clinton Bros.

Champion Prize, for best bag of wheat exhibited, No. 3929, W. G. Reinhard.

R. W. HARRIS,
F. B. GUTHRIE.

The following information regarding the prize-winning wheats which was kindly supplied by the Secretary of the Royal Agricultural Society, will be of interest both to exhibitors and others :—

Class 706.—Macaroni Wheats.

First Prize, No. 3919, Chaffey Bros., Nemingha ; variety Macaroni ; grown on red soil at Calala, portion of the Peel section of the Peel River Company's last subdivision ; the land was ploughed once and sown 1 bushel to the acre, yield 16 bushels per acre.

Second Prize, No. 3920, Graham Bros., Grenfell ; variety Beloturka ; grown at Quondong, 3 miles from Grenfell, on deep chocolate soil ; sown 20 lb. to the acre, yield 29 bushels per acre.

Class 707.—Hard Wheats.

First Prize and Champion Prize for best bag exhibited, No. 3929, W. G. Reinhard, Wellington ; variety Manitoba ; grown at Oddfield, near Wellington, on chocolate soil ; sown at rate of 1 bushel per acre, yield 24 bushels per acre.

Second Prize, No. 3927, Donald McMillan, near Bathurst ; variety Manitoba ; grown on red sandy soil at Orange-road, near Bathurst ; sown at rate of 3 pecks to the acre, yield 20 bushels per acre.

Class 708.

First Prize, No. 3936, H. Souden, West Wyalong ; variety Jonathan ; grown at Hiawatha, near West Wyalong, on sandy loam ; sown at rate of 40 lb. per acre, yield 24 bushels.

Second Prize, No. 3931, Clarence Dowe, Attunga ; variety Bobs ; grown on white soil, 2 miles from Attunga ; sown ¾ bushel per acre, yield 26 bushels per acre.

Class 709.

First Prize, No. 3952, Dennis Woods, Tamworth ; variety Budd's Early ; grown on heavy black soil, 2 miles from Tamworth ; sown at rate of ¾ bushel per acre, yield 28 bushels per acre.

Second Prize, No. 3940, Clinton Bros., Corowa ; variety Steinwedel ; sown on stiff clay, at the rate of 35 lb. to the acre, yield 12 bushels.

Resumé of the Regulations under the Vegetation Diseases Act.

In the States of the Commonwealth of Australia, New Zealand, and South Africa.

F. D. BUTLER,
Inspector, Vegetation Diseases and Commerce Act.

As frequent inquiries have been made regarding the regulations in force controlling the introduction of fruit, plants, produce, &c., in each of the States of the Commonwealth, New Zealand, and South Africa, the Director of Agriculture has directed that a concise statement be prepared giving the necessary information, and is now published for the guidance of orchardists, nurserymen, exporters, importers, and the public generally, who might wish at any time to import or export products coming under these regulations.

It is pointed out that each State has its own regulations and different diseases proclaimed. These are particularised under headings of their respective State, and reference should be made to them.

Attention is drawn to the regulations in this State having reference to potatoes grown in New Zealand and Norfolk Island, the same being absolutely prohibited. The coffee plant is also prohibited, likewise grape-vines, buds, or cuttings (South Australia excepted).

. Fruit and plants slightly infected with scale pests only, if fumigated with hydrocyanic acid gas (or any other effective method, which may be prescribed from time to time) in the exporting State prior to shipment may be permitted entry into any State of the Commonwealth (South Australia and Western Australia excepted) and New Zealand, on production to the inspecting officer of the certificate issued by the exporting State. Each State, however, reserves the right of inspection at port of discharge. In South Australia and Western Australia fumigation is done by those States irrespective as to whether it has been done by the exporting State.

The charges for fumigation in this State are as follow :—

Fruit, 1d. per "packer" case, 1½d. per "box," 2d. per "gin case"; plants, 3d. per foot of floor space occupied.

The regulations of the Vegetation Diseases (Fruit Pests) Act, 1906, having for its purpose the eradication of Codling Moth and Fruit Fly, is now in operation, and is published for the information of orchardists, &c.

In South Africa, the Orange River Colony, Transvaal, and Rhodesia have published, or are about to publish, similar regulations as are now in force in Cape Colony and Natal.

NEW SOUTH WALES.

The following is a list of diseases proclaimed under the Act:—

Name.	Commonly known as—	Name.	Commonly known as—
Carpocapsa pomonella	Codling Moth.	Fusicladium	Black Spot.
Trypetinæ	Fruit Flies.	Colletotrichum adustum	,, (any species) of citrus fruit.
Selandria cerasi ...	Pear Tree Slug.	Pseudomonas campestris	,, of cabbage.
Coccidæ	Scale insects (including San José, Aspidiotus perniciosus).	Tylenchus devastatrix	Eel Worm.
Schizoneura lanigera ...	Woolly Apple Blight.	Anquillulidæ	,, (any species).
Oospora scabies ...	Potato Scab.	Phytophthora infestans	Late Blight, or Rot of Potato.
Lita solanella	Potato Moth.	Root Galls	Root Galls.
		Melanose	Melanose.

The following are the regulations governing the admission into this State of fruit slightly diseased, for jam purposes only. Section 3 lays down the conditions under which certain condemned fruit may be treated at fumigator.

Regulations.

1. In these regulations "Inspector" means any person appointed by the Minister to be an Inspector under Part III of the Act.

2. Fruit which is slightly diseased may be imported into the State of New South Wales from any other State, for manufacturing purposes only, by *bonâ fide* jam manufacturers, upon the following conditions, viz:—

(*a*) Such fruit shall be inspected by an Inspector, and may be rejected by the Minister on the recommendation of the Inspector.

(*b*) When inspected such fruit shall be taken direct to the jam factory of the importer and there manufactured; the skins of all such fruit shall be absolutely destroyed by boiling or burning forthwith; all cases in which such fruit has been carried shall forthwith be either destroyed by fire, or sufficiently steamed at the factory to destroy all fruit diseases to the satisfaction of an officer of the Department of Agriculture, who shall have free access to the said factory at all reasonable times for the purpose of inspection.

(*c*) No such fruit shall be sold or distributed unless in a manufactured state.

(*d*) All cases containing fruit which is intended for manufacture shall, prior to their arrival in Sydney, be branded with the words "For Manufacture only."

(*e*) The manufacturer shall enter into a bond with two approved sureties in the sum of £500 to observe the foregoing conditions.

3. If it is found by the Inspector that any cases of imported fruit which have been condemned contain a fair proportion of fruit which is sound and free from disease, and also some fruit which is but slightly diseased, the contents of such cases may be assorted at the fumigating chambers, Bathurst-street, Sydney, under the supervision of an Inspector, upon the following conditions, viz.:—

(*a*) Such cases with their contents must be forwarded direct from the vessel by which they are imported to the fumigating chambers aforesaid.

(*b*) Upon assortment, fruit which is free from disease may be re-packed in clean cases and disposed of in the ordinary way, while slightly diseased fruit may be disposed of to the jam manufacturers, when it shall be subject to all the conditions contained in Regulation No. 2 above mentioned.

(*c*) All fruit which upon assortment shall be deemed by the Inspector to be unfit by reason of disease for either of the foregoing purposes shall be re-shipped and sent out of the State at the importer's or consignee's expense, and may not be "tipped" or destroyed within the State upon any consideration whatsoever.

(*d*) A charge not exceeding the sum of 3d. per case shall be made for supervising the assorting.

(*e*) Before having any fruit assorted as aforesaid, every consignee or importer of fruit shall enter into a bond with two approved sureties in the sum of £50 to observe the foregoing conditions.

VINE AND VEGETATION DISEASES (FRUIT PESTS) ACT, 1906.

Regulations.

Section 4 (2).

1. Every notice for the treatment or destruction of fruit pests, plants, or packages, shall be in the form shown in Schedule 1, and directions as to the method or methods to

be employed in order to effect such treatment or destruction shall be printed in numbered paragraphs on the back of such notice, and the method to be adopted by the person upon whom such notice is served may be denoted by the number of any paragraph of such directions.

2. The following methods of treatment of plants affected by any fruit pests shall, until further notice, be deemed to be effective :—

(*a*) For Codling Moth (*Carpocapsa pomonella*).

1. All apple, pear, and quince trees must be bandaged with a band of suitable material with two folds, from the first day of November in each year until the crop has been harvested. The bandages must be examined at least once in each period of nine days, and all larvæ and pupæ found therein destroyed.
2. All infected fruit must be collected and destroyed at least once in each period of four days.*

(*b*) For any species of Fruit Fly (*Tephritidæ*).

All infected fruit and windfalls must be collected and destroyed at least once in each period of three days.*

The destruction of fruit must be effected by boiling for fifteen minutes, or by burning, and of plants and packages by burning. Fruit cases or other packages may be treated by immersion in boiling water for two minutes.

Section 4 (3).

3. Any owner or occupier desiring to apply for an order cancelling or varying notice for the treatment or destruction of any fruit pest, plant, or package, may make such application in the form shown in Schedule 2.

Where such owner or occupier resides within the Metropolitan Police District, or the Police Districts of Newcastle, Parramatta, or Broken Hill, or any Police District to which the Justices Act, 1902, is extended, he shall apply to a Stipendiary Magistrate. In all other cases he shall apply to two Justices sitting at any Petty or other Sessions of Peace for the purpose of adjudicating in a summary way. The form (Schedule 2) shall be filled up in duplicate, and when signed by the Magistrate or Justices, one copy shall be served upon the Inspector by the applicant, and such service shall be regarded as notification to the Minister as required by the Act.

SCHEDULE 1.

VINE AND VEGETATION DISEASES (FRUIT PESTS) ACT, 1906.

Department of Mines and Agriculture,

To 190 .

NOTICE is hereby given that you are required, within days from this date, to take measures for the treatment or destruction of (here insert fruit pest, plant, or package) as follows :—

You are further notified that, in default of compliance with the said requirement, an authorised person will, in pursuance of the said Act, take the said measures at your expense.

Minister for Mines and Agriculture.

SCHEDULE 2.

Form of application for order to cancel or vary notice.

To Esquire, Stipendiary Magistrate at

or† and Esquires,

Justices of the Peace at .

I hereby apply for an order cancelling *or*† varying a notice given by the Minister for Mines and Agriculture under the provisions of section 4 (2) of the Act No. 37, 1906, requiring me to take certain measures and do certain acts specified in such notice, upon the following grounds, namely :—

Signature,

Address of applicant,

Dated at , the day of 19 .

I *or* We hereby appoint the day of , 19 , at the hour of at the Police Court for the hearing of this application.

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* NOTE.—Growers are advised to pick off and destroy any infected fruit remaining on the trees.

† Strike out the unnecessary words.

VICTORIA.

VEGETATION DISEASES ACT, 1896.

IMPORTATION OF THE FRUITS OF CERTAIN TREES AND PLANTS INTO VICTORIA OVERLAND FROM NEW SOUTH WALES AND QUEENSLAND PROHIBITED.

PROCLAMATION.

I, THE Lieutenant-Governor of Victoria, by and with the advice of the Executive Council thereof, do by this my Proclamation absolutely prohibit the importation, introduction, or bringing into Victoria overland from the States of New South Wales and Queensland of any green fruit or vegetables of the following kinds, that is to say:—Apples, Apricots, Lemons, Mandarins, Mangoes, Nectarines, Oranges, Peaches, Pears, Persimmons, Plums, Quinces, Shaddocks, Bananas, Cucumbers, Cape Gooseberries, Grenadillas, Melons, Pineapples, Strawberries, Tomatoes, and Sweet Potatoes.

REGULATIONS.

All importers from outside the State of Victoria of trees, plants, or vegetables the importation, introduction, or bringing into Victoria of which is for the time being prohibited, except subject to regulations not being of a kind with respect to which any other specific regulation or regulations is or are for the time being in force, must give notice to the inspector under the Vegetation Diseases Act upon arrival of any trees, plants, or vegetables before the removal of such trees, plants, or vegetables from any dock, pier, wharf, station, or warehouse where such trees, plants, or vegetables have been landed.

No person shall remove any trees, plants, or vegetables from any dock, pier, wharf, station, or warehouse unless and until such trees, plants, or vegetables shall have been examined and checked in an area, enclosure, or building approved by the inspector, and a certificate or written permission for removal shall have been obtained from the inspector.

No person shall land or attempt to land any bananas from any steam-ship or other vessel until each and every bunch shall have been examined by an inspector, and all diseased stalks or portions of stalks, diseased bananas, or bananas suspected to contain disease or insects, shall have been removed from such bunches.

No person shall land on any dock, pier, wharf, or any place whatsoever in Victoria any diseased stalks or portions of stalks, diseased bananas, or bananas suspected to contain disease or insects, and such diseased stalks or portions of stalks, diseased bananas, or bananas suspected to contain disease or insects, shall be destroyed by fire or removed from the State of Victoria.

No person shall remove any bananas which have been permitted landing from the importing vessel until such have been further examined in an area, enclosure, or building approved by the inspector.

No person shall remove any bananas or any portion of such bananas from any dock, pier, wharf, or any place whatsoever whereon bananas are awaiting certification unless and until written permission so to do shall have been obtained from the inspector.

No person shall discharge bananas from any vessel during the hours of darkness except under special permit from the Minister of Agriculture.

All importers from outside the State of Victoria of the fruit or any part of any tree of the citrus family must give notice to the inspector under the Vegetation Diseases Act upon the arrival of the fruit or any part of any tree of the citrus family before the removal of such fruit or any part of any tree of the citrus family from any dock, pier, wharf, station, or warehouse where such fruit or any part of any tree of the citrus family have been landed.

No person shall remove the fruit or any part of any tree of the citrus family from any dock, pier, wharf, station, or warehouse unless and until such fruit and every part of any tree of the citrus family shall have been examined and checked in an area, enclosure, or building approved by the inspector, and a certificate or written permission for removal shall have been obtained from the inspector.

Any person who shall be guilty of a breach of or who shall fail to comply with these regulations shall be liable to a penalty of for the first offence not exceeding One pound and for any subsequent offence not exceeding Ten pounds.

A charge is made for inspection of fruit imported into this State, as follows:—

Bananas	...	Each bunch, one halfpenny.
		For each case or package not exceeding one bushel in capacity, one halfpenny.
		For each case or package exceeding one bushel in capacity, one penny.

Citrus Fruits ... **Each case or package not exceeding one bushel in capacity, one half-penny.**
Each case or package exceeding one bushel in capacity, one penny.

The following are the proclaimed diseases under the Act:—

Name.	Commonly known as—
Aspidiotus rossi ...	Black Flat Scale.
,, coccineus	Red or Orange Scale.
,, perniciosus	San José Scale.
,, ficus ...	Fig Scale.
Chronaspis citri ...	White Scale of Orange.
,, eugeniæ ...	White Mussel Scale.
Lecanium oleæ ...	Olive Scale.
Mytilaspis citricola ...	Lemon Leaf or Peel Scale.
,, pomorum	Apple Bark or Mussel Scale.
Icerya purchasi ...	Cotony Cushion Scale.
Cacæcia responsana ...	Light-brown Apple Moth.
Carpocapsa pomonella	Codling Moth.
Heliothis armigera ...	Tomato Moth.
Dacus tryoni	Queensland Fruit Fly.
Halterophora capitata	European ,,
Leptops lopei ...	Apple Root Borer.
Phylloxera vastatrix	Vine Louse.
Myzus cerasi.. ...	Black Peach Aphis.
Schizoneura lanigera	Woolly Aphis.
Selandria cerasi ...	Pear and Cherry Slug.
Calandra oryzoe ...	Rice Weevil.
,, granaria ...	Grain ,,
Athistoma undulata	Grain Beetle.
Bruchus chinensis ...	Bean and Pea Weevil.
,, emarginatus	,, ,,
,, pisi	,, ,,
Cecidomya oryzoe ...	No common name.
,, destructor	Hessian Fly.
Tylenchus tritici ...	EarCockle Eelworm.
Heterodera radicola ...	Root-knob ,,
,, schactie ...	Beet Eelworm.
Acarid	"Maori" on citrus fruits.
Fusicladium pyrinum	Pear Scab.
,, dendriticum	Apple Scab.
Phyllosticta circumscissa.	Shot Hole of Apricot.
Exoascus deformans	Leaf Curl of Peach.
Phoma citricarpa ...	Anthracnose, or Black Spot of Orange and Lemon.
Puccinia pruni ...	Prune Rust.
Cladosporium carpophilum.	Peach Freckle.
Phytophthora infestans	Potato Disease.
Melanose	Melanose.
Bitter Pit	Bitter Pit.
Lita Solanella ...	Potato Moth.
Tylenchus devastatrix	Stem Eelworm.

VICTORIAN FRUIT CASES ACT, 1906.

The above Act will come into operation on 1st July next, and growers and exporters should make themselves acquainted with its requirements.

After the above-mentioned date the sale of fruit will not be permitted unless it be packed in cases of dimensions set out in the Act, with the exception that for the first two years of the operation of the Act the restrictions as to sizes will be waived, provided the weights or numbers of the contents are legibly marked on each package.

It is pointed out that although cases of fruit arriving from other States may not be considered as actually exposed for sale upon their arrival, nevertheless, before the contents can be sold it will be necessary that the fruit be repacked into cases of the prescribed sizes.

The most important clauses in the Act are the following:—

3. The restrictions contained in this Act shall not apply—
   (*a*) to the sale or export of fruit in a tray, basket, cask, or bucket of any shape or size whatsoever; or
   (*b*) to the sale or export of fruit in a case for which letters patent were in force in Victoria immediately befor the commencement of this Act; or
   (*c*) to the sale or export of fruit in a crate within which there are trays for such fruit; or
   (*d*) to the sale of fruit within two years after the passing of this Act in any package whatsoever on which or on a label card or tag attached thereto the net weight of the contents is truly and legibly printed, stencilled, impressed, or marked in letters of not less than one inch in length.

Every package referred to in paragraphs (*a*) (*b*) and (*c*) of this section shall have the weights or numbers of its contents legibly marked on such package.

4. (1) Where any fruit is sold in a case such fruit shall be contained in a double-case single-case or half-case of a size and having (subject to an allowance for shrinkage as hereinafter provided) the measurements specified respectively in column two of the First Schedule to this Act, and any case shall for the purposes of this Act be deemed to have the capacity specified respectively in column three of the said Schedule.

(2) Where fruit is sold in a case which has previously been used for any purpose whatsoever a shortage of five per centum from the cubical contents respectively set out in column three of the said Schedule shall be permitted as an allowance for shrinkage.

5. (1) Where any fruit is exported in a case from Victoria to any country or place such fruit shall be contained only in a single-case or half-case which has not previously been used for any purpose whatsoever.

(2) No case shall be used for the export of fruit unless it is of the size and measurements specified in column two of the Second Schedule to this Act, and a case or half-case of such size and measurements shall for the purposes of this Act be deemed to have the capacity specified respectively in column three of the said Schedule.

(3) No allowance for shrinkage will be permitted for cases used for export of fruit.

(4) The foregoing provisions of this section shall not apply to fruit exported from Victoria to any State of the Commonwealth of Australia or to New Zealand.

6. (1) No person shall sell fruit in a case or export or attempt to export from Victoria fruit in a case unless and until such case has been legibly and durably impressed, printed, or marked at each end on the outside of such case—

(*a*) with the name and address of the maker of the case; and

(*b*) with the words "Guaranteed by maker to contain two imperial bushels" or "Guaranteed by maker to contain one imperial bushel" or "Guaranteed by maker to contain one-half an imperial bushel" as the size of such case may warrant.

(2) The name address and guarantee as aforesaid of the maker of a case shall be legibly and durably impressed, printed, or marked at each end on the outside within a space measuring not more than three inches long and one and a half inches wide.

SCHEDULES.

First Schedule.—Sizes, Measurements, and Capacities of Cases.

Case.	Measurements.	Capacity.
Double-case ...	26 inches long, 12 inches broad, and 14¼ inches deep by inside measurements, and clear of all or any divisions.	Not less than 2 imperial bushels, or cubical content of 4,446 cubic inches.
Single-case ...	26 inches long, 6 inches broad, and 14¼ inches deep by inside measurements, and clear of all or any divisions; or,	Not less than 1 imperial bushel, or cubical content of 2,223 cubic inches.
	18 inches long, 8⅞ inches broad, and 14 inches deep, by inside measurements; no divisions shall be allowed in such case.	Not less than 1 imperial bushel, or cubical content of 2,237 cubic inches.
Half-case ..	26 inches long, 6 inches broad, and 7⅛ inches deep by inside measurements, and clear of all or any divisions; or,	Not less than one-half of an imperial bushel, or cubical content of 1,112 cubic inches.
	18 inches long, 7 inches broad, and 8⅞ inches deep, by inside measurements; no divisions shall be allowed in such case.	Not less than one-half of an imperial bushel, or cubical content of 1,119 cubic inches.

Second Schedule.—Sizes, Measurements, and Capacities of Export Cases.

Case.	Measurements.	Capacity.
Single-case ...	18 inches long, 8¾ inches broad, and 14 inches deep, by inside measurements; no divisions shall be allowed in such case.	Not less than 1 imperial bushel, or cubical content of 2,237 cubic inches.
Half-case ...	18 inches long, 7 inches broad, and 8⅞ inches deep, by inside measurements; no divisions shall be allowed in such case.	Not less than one-half of an imperial bushel, or cubical content of 1,119 cubic inches.

QUEENSLAND.

The following are the proclaimed diseases under the Act:—

Name.	Commonly known as—
Carpocapsa pomonella	Codling Moth.
Aspidiotus perniciosus	San José Scale.
Mytilaspis pomorum	Mussel scale of Apple.
Parlatoria probus ...	Parlatoria Scale of deciduous trees.
Aphis persicæ-nigra ..	Black Aphis of Peach, &c.
Schizoneura lanigera	Woolly Aphis of Apple.
Tephrites tryoni ...	Australian Fruit-fly.
Ceratitis capitata ...	Exotic Fruit-fly or Maggot.
Trypeta pomonella ...	American Fruit-fly of Apple.
Ceroplastes ruber ...	Pink Wax Scale.
Mytilaspis fulva ...	Fulvous Orange Mussel Scale.
,, gloveri ...	Glover's ,, ,,
Aspidiotus coccineus	Red Circular Scale.
,, ficus ...	Purple ,,
,, limomi ...	Pale ,,
Chionaspis citri ...	White Scale of Orange.
Parlatoria pergandii	Pergand's Palatoria Scale of Orange.
Lecanium spp. ...	Black and Brown Soft Scales.
Chionaspis biclavis ...	Burrowing Scale.
Dactylopius vastator	Chinese Mealy Bug.
Coccidæ	Foreign scale insects not established in the State.
Phylloxera vastatrix	Grape Phylloxera.
Bruchus spp.	Pea Weevils.
Cecidomyia destructor	Hessian Fly.
Scarabœid larvæ ...	Cane Grubs.
Sphenophorus spp. ...	Cane Beetle Borers.
,, ,, ...	Banana ,,
Cylas formicarius ...	Sweet Potato Weevil
Lita solanella ...	Potato Moth Borer.
Smynthurus spp. ...	Lucerne "Flea."
Adoretus umbrosus...	May Bug of Hawaii and Japan.
Fusicladium dentriticum.	Black Spot or Fusicladum.
Fusicladium pyrinum	Black Spot or Pear Scab.
Glœosporium spp. ...	Black Brand or Spot.
Phytophthora infestans.	Potato Disease.
Hemileia vastatrix ..	Coffee Leaf Disease.
	Peach Yellows.
	,, Rosette.
Cuscuta spp.... ...	Dodder.
Tilletia fœtens ...	Wheat Bunt.

SOUTH AUSTRALIA.

The proclamation published hereunder deals with the whole question of the introduction of plants and fruit into the above State.

Attention is drawn to clause 1, which absolutely prohibits the importation of grapes, mangoes, guavas, persimmons, tomatoes, cucumbers, or fruits of any plants of the citrus family.

It is important that the conditions embodied in clause 7 should be complied with, and it is notified that potatoes and other root crops come under the requirements of this clause, it being essential that no potatoes, &c., grown within 50 yards of any vines be sent to this State; it is also necessary that these root crops be thoroughly cleansed of soil prior to shipment, for unless this is done they cannot be admitted.

The following is the form of declaration:—

IMPORTATION INTO SOUTH AUSTRALIA OF LIVING PLANTS OR PORTIONS THEREOF.

DECLARATION.

Contents of package—Living plants of
Grown at Consigned by
Consigned to Shipped by

We, do hereby solemnly and sincerely declare:

1. That this packet contains no vines or portions of vines.

2. That these plants were grown at a greater distance than 50 yards from any vines or roots of vines.

3. That no phylloxera exists or has existed in the nursery or garden in which these plants were grown.

4. That the whole of these plants are perfectly free from that pest known as Phylloxera vastatrix.

And we make this solemn declaration conscientiously believing the same to be true.

Signature of consignee.

Declared at this day of

Before me J P.

A charge is made for the inspection of fruits, &c., as follows:—3d. per bushel for all fruits excepting pineapples, which are charged 3d. per case, which has a cubic capacity of 1¾ bushels. This charge covers opening cases, unwrapping the fruit (if papered), disinfecting them with hydrocyanic acid gas if deemed necessary, replacing but not rewrapping the fruits, and nailing up the cases again. The consignees pay all cartage charges.

THE SCHEDULE.

Regulations relating to the introduction of trees, plants, and fruits into South Australia.

1. (*a*) The introduction into South Australia of grape-vines and any portions thereof, of mangoes, guavas, persimmons, tomatoes, cucumbers, and the fruit of any plant of the citrus family, from any country or place, is absolutely prohibited.

(*b*) Living trees, plants, or portions thereof (not being grape-vines or portions thereof), and fruits (not being grapes, mangoes, guavas, persimmons, tomatoes, cucumbers, or fruits of any plant of the citrus family) may be introduced into South Australia from any country or place under and subject to these regulations, but not otherwise.

(*c*) Living trees, plants, or portions thereof, the introduction of which is not herein prohibited, may be introduced only through the port of Port Adelaide, except as provided in part (*d*).

(*d*) Living trees, plants, or portions thereof (not being fruit) may be introduced at Adelaide by parcels post.

(*e*) All living trees, plants, or portions thereof intended for introduction into South Australia must, prior to being landed or introduced, be thoroughly cleansed of soil: Provided always that any Inspector may admit plants growing in pots, if in his opinion there is no danger in importing them.

2. No fruit or other product of any tree or plant shall be landed on any wharf, jetty, or other structure in the State of South Australia without the written permission of an inspector first obtained.

3. All living trees or plants, or portions thereof, or fruits introduced into South Australia from any country or place, shall, on being landed or introduced, be forthwith delivered into the custody of some inspector or some officer of Customs, and shall, at the expense of the importer or consignee thereof, be conveyed in original unopened packages to such place in such manner as the Commissioner shall direct.

4. An Inspector shall examine such trees, plants, or portions thereof, or fruits, and may treat such trees, plants, or portions thereof, or fruits, in such manner as he may think desirable, or may order that such trees or plants, or portions thereof, or fruits, and the boxes or packages in which they were packed, or either of them, shall be destroyed if, in his opinion, there is any danger in importing them.

5. The expense of conveying such trees, plants, portions thereof, or fruits to the place fixed for their examination, and of the examination and treatment or destruction thereof, shall be borne by the consignee or introducer thereof, and shall be paid before they are delivered to such consignee or introducer.

6. No person shall be entitled to any compensation by reason of any damage to or by the destruction of any tree, plant, portion thereof, or fruits, or of any box or package under these regulations.

7. No plant or portion thereof shall be introduced into South Australia from any country where the insect known as Phylloxera vastatrix is known to exist unless accompanied by a declaration made by the grower before a justice of the peace, or British Consular agent in the State or country of origin, to the following effect:—

(a) That the case contains no grape-vines or portions thereof.
(b) That the plants were grown at a greater distance than 50 yards from any grape-vines or roots of vines.
(c) That no phylloxera exists or has existed in the nursery or garden in which the plants have been growing.
(d) That the whole of the plants are free from the insect known as Phylloxera vastatrix.

Any person contravening the provisions of the above regulations, or any of them, will be liable to a penalty of not less than £5, nor more than £100, or to imprisonment for any period not exceeding six months.

It is understood that in regard to the restrictions embodied in clause 1 of the regulations, that the Minister for Agriculture has modified it in so far that these fruits will be admitted on provision that they come accompanied by a certificate by a Government Inspector in the State of origin declaring the fruit free from fruit-fly, and that the district whence they come is perfectly free from this pest. Provided examination bears out this certificate the fruits will be admitted as before; but in the event of a single specimen of fruit-fly being discovered the consignment in which it is found is to be excluded.

WESTERN AUSTRALIA.

THE INSECT PESTS AMENDMENT ACT, 1898.

REGULATIONS.

Importation and Disinfection of Vine Cuttings, Buds, and Grapes.

The importation of rooted grape-vines, or grape-vines that have had their roots removed, is absolutely prohibited.

All vine cuttings imported shall be absolutely surrendered to the Chief Inspector or Local Inspector, at the port of debarkation, for the purpose of being quarantined as hereinafter provided.

All vine cuttings imported shall be quarantined by the Department of Agriculture for a period of not less than twelve months nor longer than two years, upon such grounds as from time to time shall be set apart by the said Department by advertising in the *Government Gazette*, as quarantine stations. The consignee, agent or other person engaged or concerned in the importation of any such vine cuttings as aforesaid, shall, at the time of delivering the same to the Department of Agriculture for the purpose of being quarantined, pay the Director of Agriculture a sum of 2s. 6d. for every 100 cuttings so delivered, and at the expiration of the period of quarantine, shall, upon taking delivery of his rooted vines, pay the further sum of 2s. 6d. for every 100 rooted vines so delivered to him.

Any vine cuttings imported which are, at the time of landing, in the opinion of the Chief Inspector or Local Inspector, affected with insects, fugi, blight, or other diseases injurious to grape-vines or other trees or plants, shall be destroyed under the direction of the said Inspector, and the expense connected therewith shall be borne by, and recoverable from the importer of such vine cuttings.

The Department of Agriculture shall not be liable for any loss resulting from the destruction of any cuttings under the provisions of the preceding paragraphs, or by reason of the infertility of any such cuttings while in or after leaving its custody, or whilst under its control.

SCHEDULE.

Scale of fees to be paid for the inspection and disinfection of vine cuttings and buds:—

	s.	d.
100 or less	2	6
Over 100 and not more than 500...	5	0
Over 500 and not more than 1,000	10	0
Over 1,000—for every additional 1,000 or part hereof	2	6

Disinfection of imported trees, plants, cuttings (other than vines), grafts, buds, seeds, pits, scions, and fruits.

10. All peach, nectarine, apricot, plum, prune, almond, and all trees budded or grafted upon peach stocks or roots, and all peach or other pits, cuttings, buds, or scions raised or grown in any place where the "Peach Yellow" or the "Peach Rosette" are known to exist, are hereby prohibited from being imported into the State of Western Australia.

11. The importation into any port in Western Australia of any fruit, plant, or part thereof infested with the Codling Moth, Mussel Scale, Queensland Fruit Fly, Phoma citricarpa, Aspidiotus nerii, Phylloxera, San José or Pernicious Scale, the Mining or Chionaspis Scale, the Wax Scale, or within internal parasites, such as the larvæ of the Codling Moth, Fruit Flies, Nematodes or bacterial diseases, with Melanose fungus, or with any pests, parasites, or fungi which may from time to time be declared as such by the Governor-in-Council under section three of "The Insect Pests Amendment Act, 1898," is absolutely prohibited.

12. All consignments of fruit, or portions of consignments, consisting of one or more varieties of fruit, of which 15 per cent. of the cases in the consignment or of the said portion thereof are found to contain fruit infected by Codling Moth or Fruit Fly, shall be destroyed.

13. The importation into any port in Western Australia of any pear trees, stocks, or cuttings from the United States of America is absolutely prohibited.

14. Soil or compost in pots, cases, or packages, and transportable material of any kind used for packing or surrounding fruit, is hereby prohibited from being removed from the first port or place of debarkation, or from being offered for sale, gift, distribution, or transportation until the said material (unless otherwise directed by the Director of Agriculture) has been disinfected by dipping the same and keeping it continually submerged for a period of not less than five (5) minutes in boiling water containing in solution not less than one pound (1 lb.) of concentrated potash to each and every ten (10) gallons of water.

15. Fruit cases containing vegetables or vegetable matter other than fruit imported into the State are also hereby required to be disinfected, as per Order II, before removal from the first port or place of debarkation.

16. Any fruit, fruit trees, vine cuttings, packages, or transportable material delivered to the chief inspector or local inspector for disinfection, and not disinfected within forty-eight (48) hours, by reason of the default of the consignee to provide the necessary labour for unpacking and repacking, may be destroyed by the chief inspector or local inspector.

SCHEDULE I.

Scale of fees to be charged for the inspection of fruit.

	s.	d.
56 lb. or under	2	6
Over 56 lb. and not more than 112 lb.	5	0
Over 112 lb. and not more than 224 lb.	7	6
Over 224 lb. and not more than 336 lb.	10	0
Over 336 lb., for every additional 112 lb. or part thereof ...	1	0

SCHEDULE II.

Scale of fees to be paid for the inspection of trees, plants, &c., of all descriptions other than vine cuttings.

	s.	d.
25 or less...	1	6
Over 25 and not more than 50	2	6
Over 50 and not more than 100	4	6
Over 100 and not more than 200	6	0
Over 200 and not more than 300	7	9
Over 300 and not more than 400	9	0
Over 400 and not more than 500	10	0
Over 500, for every additional 100 or part thereof	0	9

SCHEDULE III.

Scale of fees to be charged for the inspection and disinfection of gooseberries, raspberries, and other small plants of like nature, at the discretion of the Director of Agriculture.

	s.	d.
25 or less...	0	9
Over 25 and not more than 50	1	3
Over 50 and not more than 100	2	3
Over 100 and not more than 200	3	3
Over 200 and not more than 300	4	0
Over 300 and not more than 400	4	6
Over 400 and not more than 500	5	0
Over 500, for every additional 100 or part thereof	0	6

SCHEDULE IV.

For cuttings of plants and trees, small seedlings not in pots, strawberry plants, and bulbs.

	s.	d.
Every 1,000 or part thereof	1	0

TASMANIA.

THE VEGETATION DISEASES ACT, 1898.

REGULATIONS.

1. The Regulations made by the Governor in Council under "The Vegetation Diseases Act, 1898" (62 Vict. No. 21), and published by Government Notice (No. 213), dated the twenty-second day of June, one thousand nine hundred, are hereby revoked, and replaced by the following Regulations :—

2. Any plant or plants (other than fruit trees, cuttings, scions, buds, and grafts of fruit trees, and the barberry linden, enonyums, grape-vine, maple, acacias, rose, strawberry, raspberry, hawthorn, ash, gooseberry, currants, honeysuckle, lilac, privet, bigonia, elm, oak, birch, alder, chestnut, willow, and poplar, or cuttings, scions, buds, and grafts of any of same, the importation of which is by Proclamation, dated the third day of August, one thousand nine hundred, absolutely prohibited) shall, if imported, introduced, or brought into Tasmania from any of the Australian Colonies or New Zealand, or from Europe, be unpacked for examination by an inspector duly appointed for that purpose, at the port of entry, in a properly-constructed fumigating chamber, and the packing destroyed ; and such plant or plants shall be fumigated with hydrocyanic acid gas for not less than one hour before delivery, under the supervision of such inspector.

3. Such plants, shall, if imported, introduced, or brought into Tasmania from any of the Australian Colonies or New Zealand, be accompanied with a copy of a certificate signed by the Government Entomologist of the exporting country that the nursery in which such plants are grown for export is free from San José scale ; but this Regulation No. 3 shall not be deemed to apply to bulbs.

4. Such plants, before shipment to Tasmania from any of the Australian Colonies or New Zealand, shall be fumigated with hydrocyanic acid gas, in a properly-constructed fumigating chamber, for at least one hour, under the supervision of an inspector duly appointed for that purpose, and a certificate shall be issued by such inspector and forwarded to the Secretary for Agriculture in Tasmania that such fumigation has been properly carried out ; but this Regulation No. 4 shall not be deemed to apply to bulbs, or to the importation, introduction, or bringing into Tasmania of same.

5. Any such plants imported, introduced, or brought into Tasmania from any place whatever shall be landed at the ports of Hobart or Launceston, and at no other port in Tasmania.

6. If any such plants imported, introduced, or brought into Tasmania from any place whatever are found to contain any pest injurious to fruit trees, such plants shall be destroyed forthwith.

7. All costs and charges of inspection, fumigation and destruction shall be borne by the consignee : provided that if such consignee be an agent only, all costs and charges as aforesaid shall be borne by the person for whom he is acting ; and all costs and charges of inspection and fumigation as aforesaid shall be paid before the delivery of any such plants.

The following are the proclaimed diseases under the Act :—

Name.	Commonly known as—
Carpocapsa pomonella	Codling Moth.
Tephritis tryoni	Queensland Fruit Fly.
Selandria cerasi	Pear-tree Slug.
Coccidæ	Scale Insects.
Aspidiotus perniciosus	San José Scale.
Halterophora capitata	European Fruit Fly.
Trypeta pomonella	American Fruit Fly.

NEW ZEALAND.

Originally the importation of grape-vines, grape-vine cuttings, and grapes were absolutely prohibited by proclamation, but at a later period this proclamation was revoked, in so far as to admit of grape-vine cuttings being imported under certain conditions which are given in the proclamation subjoined.

IMPORTATION OF GRAPE-VINE CUTTINGS ALLOWED—ROOTED VINES AND GRAPES PROHIBITED. NOTICE No. 487.

A PROCLAMATION.

[James Prendergast, Administrator of the Government.]

WHEREAS by section 3 of "The Orchard and Garden Pests Act, 1896," power is given, amongst other things, to revoke, either wholly or partially, any proclamation in force at the coming into operation of the said Act: And whereas it is expedient to partially revoke a proclamation now in force which appeared in the *Gazette* of the 18th day of January, 1883, prohibiting the importation of grape-vine, grape-vine cuttings, and grapes as hereinafter mentioned : And whereas by section 3 of the said Act it is also enacted, among other things, that the Governor may from time to time, by proclamation, prohibit, either absolutely or subject to regulations, the introduction of any plant or other thing which in his opinion is likely to introduce any disease into the Colony.

Now, therefore, I, James Prendergast, the administrator of the Government of the Colony of New Zealand, in pursuance and exercise of the power and authority vested in me by the hereinbefore in part recited Act, do hereby particularly revoke the said proclamation hereinbefore mentioned, so far only as the same relates to the importation of grape-vine cuttings ; and in further pursuance and exercise of the said power and authority, and being of opinion that grape-vine cuttings are likely to introduce the disease known as phylloxera into the said Colony, do hereby proclaim and declare that the introduction into New Zealand of grape-vine cuttings from any place beyond the Colony shall be, and the same is hereby prohibited.

Provided, however, that nothing herein shall prevent the introduction from any of the Australian Colonies of fresh grape-vine cuttings, not being rooted vines, subject to the following conditions :—

(a) All grape-vine cuttings introduced into New Zealand from any such Colony shall be accompanied by a certificate in the form or to the effect hereinafter set forth. Such certificate shall be that of some officer of the Department of Agriculture in such Colony, or other department performing functions or duties having relation to viticulture at the port of shipment, whose duty it may be to examine or report upon grape-vines or grape-vine cuttings.

The following shall be the form of such certificate, and the same may be altered or modified as circumstances require ; but the possession of such certificate shall not relieve any person seeking to introduce such vine-cuttings into New Zealand from any other liabilities he may be subject to under the provisions of the said Act or any other law affecting the same :—

I (*state name and title*), hereby certify that the consignment of (*state number*) grape-vine cuttings addressed to (*name and address of consignee*), and consigned by (*name and address of consignor*), come from a district in the Colony of , which is free from phylloxera, and (if the fact be so) that they have been treated in such a manner as to destroy any insects or eggs should such be present.

Dated at in the Colony of this day of 19 .

(*Signature*).

(b) On production of the above certificate at the office of an inspector appointed under the said Act at the port of arrival in New Zealand, such inspector may, if satisfied that the certificate applies to the cuttings proposed to be introduced, and that the law is otherwise complied with, allow such cuttings to be landed and disposed of without further restriction.

Given under the hand of His Excellency Sir James Prendergast, Knight, Chief Justice, Administrator of the Government in and over Her Majesty's Colony of New Zealand and its Dependencies, at the Government House at Wellington, and issued under the Seal of the said Colony, this 6th day of July, in the year of our Lord 1897.

JOHN McKENZIE.

GOD SAVE THE QUEEN !

The following are the proclaimed diseases under the Act :—

Name.	Commonly known as—
Coccidæ	Scale insects (any species).
Tephrites	Queensland Fruit Fly.
Alternaria solani	Early Potato Blight.
Phytophthora infestans	Irish Potato Blight or Potato Rot.
Fusicladium dendriticum	Apple Scab or Black Spot.
,, pyrinum	Pear Scab.
Bacillus amylororus	Pear Blight or Fire Blight of Pears.
Lita solanella	Potato Moth.

SOUTH AFRICA.

CAPE OF GOOD HOPE.

It is pointed out that no diseases are specially proclaimed. The force of the regulations is chiefly in their prohibiting or severely restricting trees and fruit-bearing plants. Such as are allowed introduction, in common with fruit imports, are inspected. The fruit disease which occasions most trouble is *Fusicladum dendriticum* (apple scab or black spot of the apple), and apples which are not carefully sorted to exclude the presence of this disease are likely to be refused admittance. When scale insects are present fruit is ordered to be fumigated. The regulations are well set out in February issue of the *Cape of Good Hope Agricultural Journal*, which is here reprinted, and gives all necessary information.

OVER-SEA PLANT IMPORT REGULATIONS.

The attention of the public who may wish at any time to import plants of any kind is drawn to the revised over-sea plant import regulations published as Proclamation 502, 1906, on 25th December. By mutual arrangement, the Orange River Colony, Transvaal, Natal, and Rhodesia have published, or are about to publish, similar regulations. The new Cape schedule is in most respects identical with the one which it supersedes, but certain modifications have been made with the view of securing greater efficiency, and also uniformity with the regulations of the other colonies. The full text of Clauses I to IV, those which it is most essential should be understood by parties who may wish to order plants from abroad, are here reproduced in full, and explained. Parties who are familiar with the old regulations should note that only certain specified kinds of fruit-tree stocks may now be imported, and that a special permit is required to introduce any kind of fruit-bearing plant.

I. No person shall introduce any tree, plant, or portion thereof, such as cuttings, roots, tubers, bulbs, seeds or fruit otherwise than by post or through one of the following seaports, namely, Beira, Lourenco, Marques, Durban, East London, Port Elizabeth, Mossel Bay, and Cape Town, save by special authority from the Secretary for Agriculture.

Articles for the Cape Colony, landed at one of the ports outside the Colony, will be dealt with at that port or at some intermediate point. It is some advantage to have consignments affected landed at Cape Town, as if any irregularity has occurred, the

matter can there be adjusted with the least delay, owing to this port being the head-quarters of the Chief Inspector, to whom all questions which cannot be settled by the local inspector must be referred. For the same reason it is preferred that parcels affected be addressed "*via* Cape Town for inspection"; but the inspection of parcels by post has also been arranged for at Port Elizabeth, East London, King William's Town, and Kimberley.

II. No person shall introduce :—

(*a*) Any eucalyptus, acacia, or coniferous plant, or any living portion thereof, with the exception of seed.

(*b*) Any stone fruit-tree or any living portion thereof which was grown in any part of North America in which either of the diseases known as Peach Yellows or Peach Rosette exists.

(*c*) Any grapes in their fresh state.

(*d*) Any live peach stones.

(*e*) Any stocks whatever with the exception of :—

Pear, plum, apricot, cherry, mango, persimmon. Apple accepted by the Secretary for Agriculture as being resistant to the attack of Woolly Aphis (*Schizoneura lanigera*).

(*f*) Timber with the bark on, except scaffolding poles shipped from Baltic Sea or from Canada, and except piles of the turpentine tree (*Syncarpia laurifolia*).

The term "stocks" in this clause shall mean young rooted plants intended for budding or grafting purposes.

'Eucalyptus" means any species of the extensive genus of that name. "Acacia" likewise refers to every plant of the genus *Acacia*, in which genus is included the Australian blackwood and the various wattles. "Coniferous plant" means any species of the family *Coniferae*, that is the Pine family, which comprises the pines, spruces, larches, junipers, cedars, cypresses, arbor-vitaes, and araucarias, and also the less well-known *Ginkgo*, *Callitris*, and *Retinospora*. The common Norfolk Island Pine is a kind of araucaria.

Stone fruit-trees are held to include any and all plants of the genus *Prunus*, including plums, cherries, peaches, apricots, and almonds, whether grown for fruit or ornament.

The fruit-tree stocks listed are still admitted because of the claim that a prohibition on their introduction would be an unbearable hardship on some nurserymen. All stocks are fumigated on arrival with hydrocyanic acid gas, but there is danger of many troubles that would not be affected by the fumigation, and which cannot be detected at the time of importation, however careful the inspection.

III. The introduction of the following plants, or of any living portion thereof, except seed and fruit, shall be limited to importations made by the Government under such precautionary measures as it may deem necessary :—

(*a*) Grape-vines or other plants of the family *Vitaceae*.

(*b*) Sugar-cane.

(*c*) Plants cultivated for the production of rubber.

The family *Vitaceae* includes the ornamental species of *Vitis* and *Ampelopsis*.

IV. Any tree or fruit-bearing plant or scion or other portion thereof for propagation, not prohibited or restricted by Clauses II or III, may be introduced; but any such importation except of fruit-tree stocks shall be allowed only under special permit from the Secretary for Agriculture. Such a permit shall be issued at the discretion of the Secretary for Agriculture, and it shall limit the introduction to not more than ten trees or 100 cuttings of any one variety, and such permits shall not be issued for more than an aggregate of 100 trees or 1,000 cuttings to any one person during one year. For the purpose of this clause the term "tree" shall include any plant of the nature of a tree. In case of dispute as to whether any plant falls under the restriction, the decision of the Secretary for Agriculture shall be final.

This clause requires careful reading to get the full import. It restricts the introduction of all fruit-bearing plants, and of all kinds of *trees* to the limited numbers mentioned, and requires that special permission be obtained to introduce even a limited number. To avoid any chance of a misunderstanding it may be well to specify that currant and gooseberry bushes, strawberry runners, blackberry and raspberry plants, pineapple and banana suckers, and also nut-bearing shrubs, such as the filbert, are included in the term "fruit-bearing plants." The term "tree" is interpreted liberally, or otherwise according to the risk thought to attend on the introduction of the kind of plant concerned; but though distinctions are drawn somewhat arbitrarily in certain cases, consistency is rigorously maintained by means of a compiled reference list of decisions, a

copy of which is lodged with each inspector. Parties who are in doubt whether or not kinds of plants which they wish to import will be admitted or not are advised to communicate with the Government Entomologist, Department of Agriculture, Cape Town, before venturing to order. Amongst the plants admitted, and concerning which there is no need to inquire, are bulbs of all kinds, tender florists' plants, such as pelargoniums, cannas, fuchsias, chrysanthemums and carnations, greenhouse palms, ferns, azaleas, camellias, gardenias, syringas (lilacs), pittosporums, privets, rhododendrons, and all kinds of roses. Amongst the plants that require a permit are all kinds of *Cydonia*, *Crataegus*, *Prunus*, *Laurus*, *Ilex* (holly), *Magnolia*, *Catalpa*, maple, beech, birch, and poplar.

An applicant for a permit must state :—

(*a*) The full name of the kind and variety of each sort it is desired to introduce, and the number of each.

(*b*) The name and address of the nursery or party who is to supply the plants.

(*c*) Where the plants are to be set out, and whether or not it is intended to propagate them.

(*d*) The reasons thought to justify a special permit.

Permits are not given for the introduction of plants which would be sold at auction, nor for kinds readily procurable in the country, or easily raised from seed; and in the case of fruit-trees and fruit-bearing plants, applications are likely to meet with refusal unless the parties are nurserymen or skilled fruit growers, professional or amateur, who require the varieties for testing and propagation.

Those who may wish to introduce plants from over-sea into one of the other South African colonies are advised to take the precaution of consulting the plant import regulations of that colony. Although the schedules for the several colonies are in most respects identical in their restrictions and prohibitions (or will be when those for the Transvaal and Orange River Colonies are published), there are a few differences. Only the Cape Colony prohibits the introduction of over-sea grown grapes. Natal and Rhodesia, in addition to restrictions on the introduction of plants identical with those imposed by the Cape, require that special permission be obtained for the introduction of flowering and ornamental plants of all sorts.

It seems unnecessary for present purposes to give the remaining clauses of the schedule. Their bearing may be given in a few sentences. It is ruled that anything introduced in violation of clauses I to IV, above given, may be destroyed by the inspector. All plants and all parts thereof which are introduced, including fruit, are subject to a strict examination and to any treatment deemed necessary to cleanse them of any pest which may be found. The destruction of articles is provided for, should no treatment at command be considered effectual. All trees and woody plants (including roses) have to undergo fumigation as a precautionary measure. As a check on illegal introductions, unintentional or designed, the consignee is ordinarily called upon to furnish a list of the kinds of plants, and the number of each kind comprised in a consignment, and plants not declared in the list, or which are falsely entered, may be confiscated. No charge is made for the inspection, but all the expense of opening and closing cases, &c., of any treatment that may be prescribed, and of fumigation, is borne by the consignee; the charge for fumigation is according to a fixed scale. The Government accepts no responsibility for any loss or damage.

Consignees may secure, from the inspector at the port, forms on which to enter the particulars that are required, but the inspector will accept lists of plants on separate sheets if they are certified on behalf of the consignee to be correct; this admits of a list sent by the consignor being submitted. The generic and specific botanical names of the plants should be given, or else the commonly accepted English names; varietal names are unnecessary. Each plant, or bundle of plants, should be labelled or otherwise distinguished so as to assist in its identification. Much trouble is saved when plants are packed with a view to their being readily examined. If packed solidly in cases or bales, plants have to be removed for inspection and treatment; whilst if they are packed widely apart and with their tops free, both inspection and fumigation may be possible without their being removed. This suggestion applies particularly to ferns, palms, and florists' plants in general, including roses, and to plants introduced by Parcels Posts alike with those than come as freight. A saving in postage may be effected by having plants wrapped in straw and moss, and then stitched up in canvas, but a parcel of this character must be opened up entirely for examination, and it cannot be made up again in as good order as at first. In such parcels plants should have their roots balled in moss independent of the outer wrappings.

NATAL.

The regulations obtaining in this colony are practically identical with those in Cape Colony, but have in addition a number of insect and fungus diseases proclaimed. Particulars are given hereunder:—

The following are the proclaimed diseases under the Act:—

1. Members of the family Coccidæ (Red Scales, Mussel Scales, Purple Circular Scales, White Peach Scales, Brown Scales).
2. Members of the family Aphididæ (Woolly Aphis, Phylloxera).
3. Natal Codling Moth.
4. Fruit Flies.
5. Gall Worms.
6. Peach Yellows.
7. Root Fungi.

Name.	Commonly known as—
Carpocapsa pomonella	Codling Moth.
Aspidiotus perniciosus	San José Scale.
Selandria cerasi	Pear Slug.
Ceratitis capitata	Cape Fruit Fly.
Mytilaspis pomorum	Apple Mussel Scale.
Chionaspis citri	Orange Mussel Scale.
Parlatoria ziziphus, and .. ... / ,, pergandei	Parlatoria of the Orange.
Mytilaspis gloveri	Glover's Scale.

Plant Diseases.

Orange Yellows and Peach Rosette. Crown Gall.
Fusicladium of the Apple.

1. These regulations apply generally to any "plant," as defined in the above cited Act, entering the colony of Natal.

2. Any plant or any package, case, pot, or other covering of the same may before being delivered to the consignee, be detained and examined by an inspector, appointed under Act 45 of 1904, so as to determine as far as possible whether or not any insect pest or plant disease is present, and it shall be the duty of the consignee or his agent to open the coverings and to afford every facility to the inspector during his examination.

Such articles may, when deemed necessary by the Inspector, as a precautionary measure against the introduction of any insect pest or plant disease be treated by or at the expense of the consignee in the manner prescribed by and to the satisfaction of the Inspector, and if not so treated, or if the treatment be deemed ineffectual the Inspector shall destroy the consignment.

3. Any article subject to examination under these regulations which is introduced into the colony by post may be examined by an Inspector, and, if found infected with any insect pest or plant disease, shall be destroyed or cleansed at the discretion of the Government Entomologist, and any such article may, as a precautionary measure, be treated by the Inspector.

All expenses incurred under this regulation shall be paid by the addressee.

4. The inspection and treatment of any consignment imposed by these regulations shall take place on premises provided by the Government for the purpose, but special arrangements may be made with the Minister of Agriculture for the execution of all the provisions of Regulation 2 on the premises of the consignee, or other place, when approved facilities are provided.

5. If any article in the examination provided for in Regulations 2 and 3 shall be found actually infected in whole or in part with any insect pest or plant diseases, it shall, together with all other articles in the same receptacle, and all packing material, be cleansed or disinfected by and to the satisfaction of the Inspector, or if any treatment at command shall be deemed by him to be insufficient for the absolute eradication of the insect pest or plant disease, or if the Government Entomologist considers the insect pest or plant to be of a specially dangerous character the article may, upon his instructions, be destroyed without delay, no compensation being paid.

6. On the Inspector being satisfied with respect to a consignment that all the regulations and conditions herein set forth have been duly complied with, he shall issue a certificate to that effect to the consignee or addressee, but before the issue of such certificate, the consignment shall be under the Inspector's control, for the purposes of these regulations.

7. The consignee shall, when called upon to do so by the Inspector, furnish a certificate with respect to any consignment showing the name and address of the shipper, and the

number and kind of packages, and any and all particulars of name, quantity, variety, trade-marks, and place of origin of the articles, that may be desired.

8. The Government shall not be responsible for any loss or damage that may result from the destruction of articles under the provisions of these regulations, or from any process or detention that may be considered necessary to cleanse or disinfect the articles or to discover the existence or otherwise of any insect pest or plant disease.

9. Any person contravening these regulations shall be liable to a penalty not exceeding £20 sterling for each offence.

COMMONWEALTH COMMERCE (TRADE DESCRIPTIONS) ACT, 1905.

Exporters and importers are also reminded that in addition to the inspections under the Vine and Vegetation Diseases Act that the requirements of the Commerce Act must be complied with.

These regulations do not apply to exports or imports within the States of the Commonwealth.

The main points are here set out as briefly as possible.

Exports :—A notice of intention to export must be presented to the State Supervising Officer, Department of Agriculture, twelve hours prior to shipment.

Special forms for the purpose (Form 2) are obtainable at any stationers. Full particulars must be filled in, including shipping marks, and a declaration made on face of form, same to be signed in the presence of a Justice of the Peace or a Customs Officer.

Potatoes and Fruit :—The declaration must be as to soundness. Sound or soundness (within the meaning of the Act) means freedom from disease.

Maize, Plants, or Seeds :—The declaration must be as to soundness, cleanness, and freshness.

NOTE.—Fruit and Plants found on inspection to be slightly infected with scale insects (only) will be accepted as free from disease after same have been fumigated.

Leather :—The extent to which it contains any loading of any material or other weighting substance, and if it contains any such substance, the name of such substance and the percentage thereof, provided that in the case of leather containing not more than a total of 2 per cent. of glucose and sugar taken together, and not more than a total of 3 per cent. of fat and oils taken together, the glucose, sugar, fats, and oils, shall not be taken to be weighting substances for the purposes of this regulation.

If the foregoing percentages are exceeded the same must be embodied in the trade description attached to the goods.

Trade descriptions :—A correct trade description must be attached to the goods, it may be in the form of a label or may be branded, and should embody the following particulars :—

A true description of the goods.
Name of State where produced.
Australia.
Net weight or quantity.
The full registered trading name of the manufacturer or exporter or his registered brand.

The foregoing particulars may be enclosed in a design if desired, or may be put on plainly and securely ; stencilling is recommended.

If on inspection the goods are found to be free from disease, and the markings (trade descriptions, &c.) are in order, an export permit will be issued which must be presented to the Customs Officer at the export wharf.

Honey :—The prescribed standard is : The refined unfermented honey of bees which does not contain any foreign matter.

Butter, cheese, meat, canned meat, meat extract or meat essence, bacon, rabbits, hares, jam, preserved fruits, condensed and concentrated milk and dried milk are also scheduled under the Act, and for further information reference should be made to the Department of Agriculture, or to the printed regulations obtainable at the Department of Customs.

Attention is drawn to sections 7 and 11 of the Act in reference to imports and exports which state :—The regulations may prohibit the importation or introduction into or exportation from Australia of any specified goods unless there is applied to them a trade description of such character relating to such matters and applied in such manner as is prescribed.

Kidney Worm of Pig.

C. T. MUSSON.
Hawkesbury Agricultural College.

DURING early June a correspondent brought in from the Comleroy-road, Kurrajong, a pig's kidney infested with small worms for identification of the latter, and desiring information (1) as to the best thing to be done with regard to his remaining pigs, and (2) whether the carcass was fit for food.

Attention had been drawn to the fact that something was wrong when on killing the pig the fat around the kidney was observed to be yellow and blubbery. On opening the kidney several worms were found, about 1½ to 2 inches long, as thick as a thick knitting needle, and with transparent skin through which the coiled intestine could readily be seen.

Reference to "Veterinary Medicine," by Law, one of the latest works on this subject, enabled us to identify it as a well-known Nematode, *Sclerostoma pinguicola*. There are a few facts in relation to its history and effect on the host that may very well be pointed out to pig breeders, for which the above-mentioned work has been drawn upon.

The worm commonly inhabits a cyst (hollow space) in the fat surrounding the kidney. Living usually in pairs it sometimes invades different solid organs, such as the liver and spleen, as well as the kidney. It has been recorded from Brazil, North America, and Australia.

Eggs are deposited by the parent worm and are said to find their way to the ground with the urine and fæces. These hatch, and in a week assume the form of the young worm. No intermediate host has been demonstrated; it is therefore concluded that the young worm can be taken in and matured in the pig.

So far this is an easy matter to understand, but it is necessary to draw attention to the fact that when the worm is numerous in the liver congestion and softening of that organ may set in. To the ravages of this worm an observer attributed a destructive disease, which went by the name of hog cholera.

It is important to bear in mind that disorders easily mistaken for hog cholera may result from the presence of the worm.

It is also recorded that the parasite was found in nine out of ten pigs killed in a city abattoirs (U.S.A.), although the animals had shown no signs of illness, being in fine condition and killed for packing. Moreover, weakness, stiffness, and paralysis of the hind limbs in pigs have been attributed to this worm, a trouble which might be attributable to any one of a dozen causes. If, however, along with the paralytic symptoms the elliptical eggs of the worm are found in the urine, it is probable that the parasite is the chief cause of that trouble.

Symptoms of attack in ordinary are not easily obtained apart from indications of liver or kidney disease. Post-mortem examination is usually necessary to positively demonstrate presence of the worm.

Treatment.—As the worms are usually away from the digestive tract vermicides are not likely to reach them in a sufficiently-concentrated form, therefore no satisfactory treatment can be recommended.

Prevention.—The worms should be prevented from reproducing as far as possible by giving the eggs no chance when they reach the ground. Pigs should be excluded from infested ground. A water supply, other than such as is obtained from the surface on the pig run should be provided if possible.

No offal or flesh should be given to other pigs unless previously thoroughly cooked. The feeding trough should be regularly and thoroughly cleansed with boiling water in which salt has been dissolved. Other pigs in the herd are likely to be affected, therefore it would be well to remove them from the common run or yard, and isolate them until killed, thus giving an opportunity to clean out the run and get rid of any young worms awaiting their opportunity to get into a host.

Purchased pigs should not be added to sound herds unless there is reasonable assurance that they are free from this trouble. Nor should pigs be introduced into any yard or pen that has contained worm-infested pigs until the place has been thoroughly cleansed.

In conclusion, it may be stated that when these worms are present only in small numbers and there is no accompanying general disorder, the flesh is quite fit for food.

Club Root of Cauliflower and Cabbage.

Growers should attend carefully to the condition of their young plants before planting them out. No plants should be put in that have lumps on their roots.

Our attention has lately been drawn to plants growing near Windsor that were brought as seedlings from Melbourne. They now show a bad attack of club root.

This is a serious root disease of many cruciferous plants, both cultivated and wild. The reproductive bodies are distributed in the soil in enormous quantities when an attacked root decays. Where the plants come to nothing they should be examined, and if swellings at the base of the stem are detected they should be pulled up and burnt. Do not throw them aside or into the manure pit for that only assists to spread the trouble.

Lime is a remedy, and may be freely used with advantage.

Any plants, except of the cress family, can be grown in rotation, and it would be well not to grow cabbage, cauliflower, or turnips on infected ground for three or four years.

Seasonable Notes.

GEO. L. SUTTON,
Wheat Experimentalist.

THE season for planting being now at an end, advantage should be taken of every favourable opportunity to plough and fallow, for next season's planting, any ground not now under crop. Weather permitting, from now onwards until late spring is the best time of the year to do the bulk of the ploughing; the horses are not now required for other farm work; and during the winter it is advisable they receive a little care and attention; if ploughing, this can profitably be given them. Owing to the autumn and winter rains the ground is in suitable condition for this operation, and the weather being cool, horses and men are able to work better and in more comfort than in the summer, and in consequence the cost per acre is reduced. As usually practised, fallowing consists in ploughing the ground at this time, or a little later, and allowing it to lie in a rough undisturbed condition until near planting time. This practice has several distinct advantages; dormant plant food is liberated and made available for the use of plants, and in the autumn the ploughing, as the final preparation for the wheat crop, can be commenced earlier and with less rain than if the ploughing had not been practised. To obtain all the benefits to be derived from fallowing, the ground after being ploughed should be broken down, and as soon as the warm, dry weather commences, a two or two and a half inch surface mulch should be formed and maintained by means of the peg-tooth and disc harrow. The use of the disc harrow is necessary when weeds become troublesome. If this practice be followed, planting can be commenced at any time in the autumn with a certainty of the seed germinating and growing, provided a reasonable amount of rain has fallen during the early spring and summer, for we now know that the moisture which usually falls during some period of the year can be conserved with but little trouble. It will be seen that the benefits to be derived from working the fallowed ground are very considerable, and it is questionable whether the cost of planting wheat under such a system is very much greater than under the system of fallowing usually practised, for the working given to the ground to conserve the moisture prepares an excellent seed-bed, which, except in exceptional cases, renders the customary reploughing unnecessary. Quite half the uncertainty connected with wheat growing is due to the neglect of fallowing, or of not fallowing in the proper manner. The advantages of fallowing are such as to render such a practice in this State necessary; but whilst this is so it must be remembered that the practice burns up the organic matter in the soil, and, therefore, if our lands are not to become impoverished, a necessary feature connected with fallowing is some profitable practice which keeps up the supply of humus in the soil.

Weather Conditions during May, 1907.

A. NOBLE,
Officer-in-Charge, Meteorological Department.

THE month opened with light to moderate rain along the western slopes and tablelands as far north as Forbes. Snow also fell at several stations on the southern highlands. On the 2nd, pressure distribution indicated that the "high" had practically remained stationary, while a retrogressive movement of the "low" had taken place. This alteration of pressure caused a return of unsettled conditions on our coastal and highland parts south of Armidale, resulting in some good but isolated falls, viz., Moss Vale and Bowral, 310 points each; Maitland, 140; Muswellbrook, 130; and Ulladulla, 121 points. Showers of an isolated character continued over coastal parts almost daily until the 10th. On the 9th, some of the lowest temperatures of the month were recorded over western slopes, extending as far north as Coonabarabran, also over the central and southern tablelands. At some stations on the southern highlands the night was the coldest experienced since last winter; Kiandra reported a minimum registration of 18 degrees. On the 14th and 15th, rain fell on the north coast, and during the night of the latter date also started in the north-west districts, as the result of monsoonal influence, but only resulted in some light falls as far east as the Darling in western districts. The rain, however, still continued on coast and highlands. On the 20th and 21st a low pressure was situated between the Great Australian Bight and Adelaide, which resulted in unsettled conditions and light rains in the extreme south-west parts of New South Wales. By the 22nd, the disturbance had made rapid progress, and was centrally situated over Tasmania. Its forward movement was associated with some good rainfalls south-west of a line joining Wanaaring and Cowra; the best falls being over Riverina and south-west slopes. The following were some of the heaviest:—Albury, 147; Tocumwal, 101; Corowa, 99; Germanton and Jerilderie, each 94; Hay, 80; Deniliquin, 77; and Urana, 70 points. On the 23rd, the rain extended along the western slopes, over the Barwon tributaries, and on parts of tablelands. The falls varied from a few points to ¾ inch; thence fine weather prevailed generally until the 27th, when unsettled conditions again appeared over the Barwon tributaries, and moved as far east as the coast, extending southwards to Sydney, resulting in light to moderate, and on parts of coast heavy rainfall. The unsettled conditions continued along the coast until the end of the month, the falls in some parts exceeding 2, and reaching 4 inches, viz., Nambucca, 4·09 inches: and Mullumbimby, 2·83 inches.

The following statement shows briefly a comparison of the chief meteorological elements over India, together with Australia, as far as data are available, for the month of May, 1907 :—

	Departure from normal.		General Conditions (referring to State as a whole).
	Pressure.	Temperature.	
	Inch.	Degrees.	
India	+ ·02	− 1·1	Normal.
Sydney	+ ·15	+ 0·2	Dry western half, moderately dry eastern half.
Melbourne	+ ·11	+ 1·4	Moderately wet.
Adelaide	+ ·10	+ 0·7	Dry south coast, moderately dry centre, and above normal other parts.

The month as a whole in New South Wales may be classified as dry, especially west of the mountains, where the fall at all stations was again below the average. As during the preceding month many stations on the Lower Barwon tributaries received no rainfall, but, owing to the bountiful rains which fell over the northern districts during the early part of the year, the drought was not so severely felt there as in other parts of the State. Fortunately, Riverina has at last been relieved—a most beneficial rainstorm passed over there on the 20th and 21st, when many falls approaching or exceeding an inch were registered.

The distribution over the several subdivisions of the State was as follows :—

		Percentages. Above.		Below.
Over North Coast	from	98	to	25
Hunter and Manning ...	,,	44	,,	79
Metropolitan	,,	—	.	66 to 83
South Coast	,,	50	to	83
Northern Tableland ...	,,	9	,,	96
Central Tableland	,,	—	..	25 to 93
Southern Tableland ...	,,	—	...	1 to 100
North-western Slope ...	,,	—	...	20 to 91
Central-western Slope ...	,,	—	...	80 to 93
South-western Slope ...	,,	—	...	32 to 94
North-western Plain ...	,,	—	...	19 to 93
Central-western Plain ...	,,	—	...	78 to 100
Riverina	,,	—	...	30 to 96
Western Division	,,	—	...	20 to 100

Orchard Notes.

W. J. ALLEN.

JULY.

Fruit Fly.—This little pest, which has been in many of our States for years, doing more or less damage in some of them, has so frightened the fruit-growers of South Australia that they have temporarily prohibited the introduction

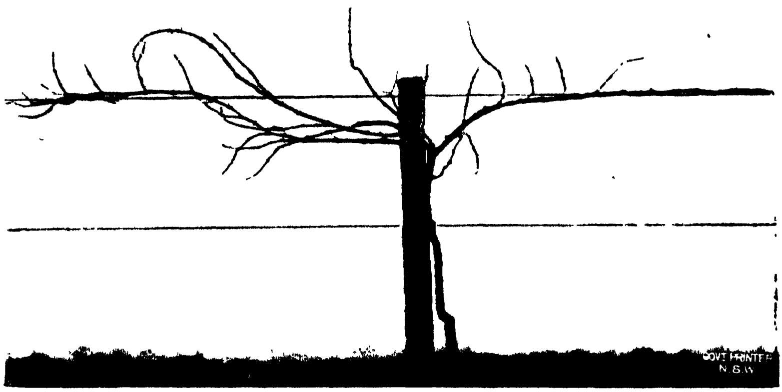


Fig. 1.

into their State of citrus fruits, mangoes, guavas, tomatoes, and cucumbers from any country or place, and at one fell swoop have closed their markets to such fruits from all other States as well as Europe—this as a result of having discovered a few of the grubs of the fruit fly in a recent shipment of oranges. Our growers and exporters will lose a little trade by this; but if the closing of some of our near at hand markets will have the effect of making our growers and exporters exploit other and larger markets, it may in the end prove a blessing rather than a hardship. I believe that Canada and the United States can take

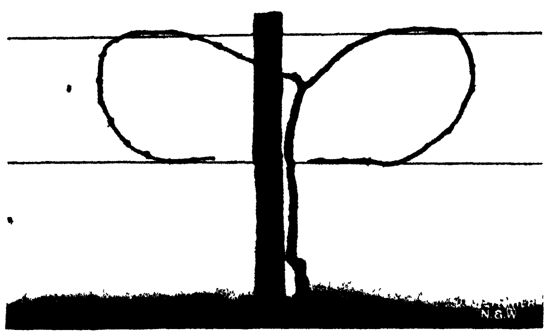
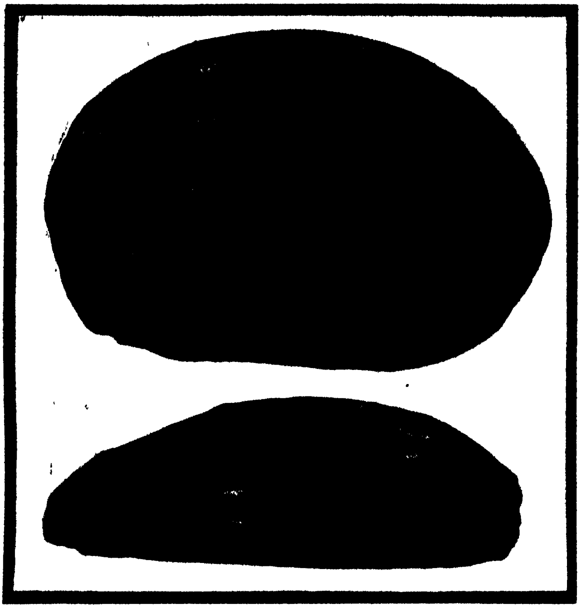


Fig. 2.

graded and packed fruit does not sell so well as that which has been properly prepared.



Silver Prune.
Natural size; showing the breadth and thickness.

The prunes shown in cut are the Silver Prune which take only about fifteen to the pound when dried. They were grown by Mr. O. C. Barberie, of Batlow, and he claims to have taken £33 worth of prunes from about a quarter of an acre. These sold at 8d. per lb.

Mr. Barberie also showed me some very fine specimens of Five Crown and Jonathan apples and Madame Cole pears, which do exceptionally well in that district.

Bathurst Experimental Farm Apples in London.

The shipment of apples sent through the Department of Agriculture from the Bathurst Experimental Farm created considerable interest on this side. They were all sold in the city by Messrs. Keeling and Hunt, of Monument Yard, to the order of the Government, and fetched good prices, notwithstanding the heavy shipments to hand during the week and the fact that beyond the 514 cases from New South Wales, the "Mooltan" brought 12,445 cases from Tasmania, 2,515 from Victoria, and 2,443 from South Australia. The New South Wales apples bore the mark: "New South Wales Government Orchard," and a crown, and this doubtless strongly recommended them to buyers. But in reality, with the exception of thirteen boxes broken and damaged, and about twenty boxes Shepherd's Perfection, which were what is called "pitty" and "spotted"—and which realised only 6s. per box—they arrived in first-class condition. Cleopatras fetched 13s. 6d.; Munro Favourites, 12s. 6d.; Stone Pippins, 9s. 6d. to 11s. 6d.; Five Crown, 10s.; and Reinette de Canada, 9s. The highest price, however, was paid for Jonathans; the first-grade realised as much as 14s. 6d. per case, and the second-grade from 10s. 6d. to 12s. 3d. Those in grade 1 were what one of the market men described as "a very pretty apple"—they looked as fresh as when they were picked. These prices compare most favourably with apples from other parts of the world, and the market view is that there is plenty of opportunity for New South Wales apples in the United Kingdom.—*Herald.*

NOTE.—Since writing the above about Fruit Fly, the South Australian Government have decided, if report speaks correctly, to allow citrus fruits into the State, provided they come from clean orchards and carry the Government certificate as to being clean. I think it will be very hard to find any fly-infested fruit for many months to come, so there is no danger in admitting citrus fruits.—W.J.A.

Practical Vegetable and Flower Growing.

W. S. CAMPBELL.

Directions for the Month of July.

Vegetables.

At time of writing the prospects look well for another good spring, which in many parts of New South Wales may be said to begin about the end of July or the beginning of August—that is, unless the season is late. In some districts winter will continue through the month, and very cold weather may prevail. But no matter when it may set in, it would be advisable to prepare in good time for the sowing and planting of spring vegetables, or those of a tender or half-hardy character. If the soil be turned up some time during the month and be left exposed to the weather, to rain, frosts, snow, and ice, it is likely to be improved—"mellowed" is the term generally used and one generally understood. If necessary, it may be manured at time of digging, but it may be well to state that if the manure—*i.e.*, farm-yard or stable manure—is well decomposed or rotted, some of the most valuable portion of it is likely to be in a very soluble condition, and should heavy rains occur before plants are ready to make use of it, a good deal may be washed out of the soil and become lost. That is the danger. The most valuable manure is nitrogen, which is applied in artificial manures such as nitrate of soda, sulphate of ammonia, and, in combination, as nitrate of potash, in blood manure, in blood and bone, and to some extent in bonedust, and also in some other forms. The nitrate of soda is extremely soluble and may easily be washed away, or a good part of it, by rain; and nitrogen in other forms soon becomes soluble, especially if warm weather should happen to set in. It will be, I think, clear from what has been stated that the best time to apply these easily-washed-away manures is either just before planting and sowing, or, better still, when the crops are growing, not in large supplies at a time, but from time to time as the plants or vegetables may be able to make the best use of them. This may be taken to apply, when practicable, to any other crops besides vegetables.

Asparagus may be planted out towards the end of the month in early districts, but the planting may be put off till early spring, and this is a safe plan to adopt in any district.

Artichoke, Globe.—Plants raised from suckers may be planted towards the end of the month or later.

Artichokes, Jerusalem.—This is one of the best of vegetables, and should be planted in every vegetable garden in quantity sufficient for the family needs. It is an excellent food for pigs, and is worth planting extensively for them in a paddock where, at the proper season, the pigs can be turned in to root up the tubers as they are required. Plant about 5 inches deep, about 1 foot apart, in rows 3 to 4 feet apart.

Bean, Broad.—Sow seeds in rows for succession once or twice, or more if required. The soil for this vegetable should be worked deep and well.

Bean, French.—In the very warmest districts a few rows may be grown. In the cold late districts it would be useless to attempt to grow this bean until frosts have passed away.

Broccoli.—Sow seed to any extent required. Prick out seedlings that seem to be fit for removal to a well-prepared bed, and set them about 5 to 6 inches apart, so that they can have ample space in which to develop. When these plants are well grown, move them as required to their permanent bed. Use abundance of farmyard manure.

Cabbage.—Sow a little seed from time to time. Prick out seedlings, and afterwards transplant as advised for broccoli.

Cardoon is worth a trial, and, if appreciated, can afterwards be grown regularly. It is a member of the Globe artichoke family, which it resembles a good deal. The inner leaves are made use of as a vegetable after they have been tied up and blanched and made tender. If the plants are grown well and the blanching has been carefully managed, the vegetable will probably be much appreciated. Good soil and plenty of moisture are necessary for the production of good plants.

Chocho.—Towards the end of the month the fruit or seed may be planted in good rich soil. This is somewhat like a short, broad, white cucumber, and may be used quite young and up to the time it matures. It belongs to the cucumber family, and should be planted where the branches can climb at will over some kind of support.

Carrot.—Sow a little seed in drills about 1 foot to 18 inches apart. Try the early Short-horn variety, which is a most useful one for home use. Sow the seed shallow, covering it very lightly with fine soil. Weed well and thin out well, and be sure to do this, or the carrots will never become so good as they should.

Cauliflower.—Sow a little seed sufficient to keep up a succession. Treat as advised for broccoli.

Capsicum or Chilli.—Seed may be sown in the warm districts, or under shelter in the late or colder places.

Cape Gooseberry.—Sow in warm districts in seed-bed. An excellent plant, the fruit of which makes the finest of preserve or good pickle. As easy to grow as a weed.

Cucumber.—It is early to chance this vegetable in the garden, except in quite warm districts; but a little seed can be grown under shelter to raise plants for early planting out.

Egg Plant.—Sow a little seed in seed-bed in warm places.

Leek.—Raise a few seedlings during the month, and any young plants already available may be planted in shallow trenches, which have been prepared and heavily manured. If the weather happens to be dry, water the young plants well before and after planting.

Lettuce.—Sow a little seed, and transplant from seed-bed to pricked-out bed seedlings that may be large enough to move. Use abundance of well-rotted manure for the lettuce, and endeavour to grow it quickly.

Onion.—Sow seed in drills, or, better still, in seed-bed, for raising seedlings for transplanting. The onion-bed should be well drained and heavily manured. If the seed is to be sown where the onions are to grow, make the surface soil as fine as it can be made and then sow in drills, barely covering the seed with fine soil.

Parsnip.—Sow a little seed from time to time if a continuous supply is needed. Dig the soil very deep. Make use of land for this vegetable that has been heavily manured for cabbage, cauliflower, or other strong-growing vegetables.

Peas.—Keep up a supply of this fine vegetable, one of the very best in cultivation. Sow in rows of 3 or 4 or 5 feet apart, or sow in double rows 6 inches or 1 foot apart. Plant the seed about 3 inches deep, 4 to 6 inches apart. Dwarf kinds which grow to a height of about 1 foot to 18 inches may be planted closer, and the rows need not be more than 18 inches apart.

Savoy.—Sow a little seed; keep the supply going, and manage as directed for broccoli. This kind of cabbage is well suited for cold districts.

Spinach.—Sow a little seed in drills about 2 feet apart, and thin out seedlings to about 1 foot apart. Cultivate well between the rows during growth.

Swede.—Best suited for the cooler districts, but can be grown very well almost anywhere during the continuance of cool weather. Sow in drills, and thin out plants well as soon as the seedlings have made three or four leaves. Cultivate well.

Tomato.—Sow seed in seed-bed in warm districts or under protection in cold. Plants made from cuttings and kept during the winter under protection may be planted in warm places. Such plants will soon go ahead and produce fruits long before seedlings raised now.

Turnip.—Sow a little seed from time to time.

Flowers.

The flowers really deserve more space than can be devoted to them, and the few short notes which can be given are of but little assistance to the grower.

As spring comes nearer and nearer, all sorts of herbaceous plants—that is, those kinds of plants which drop their leaves and stems every year, but retain life in their crowns and roots, and are therefore perennial—may be lifted, divided, and replanted, if necessary, or some may be obtained and planted. Amongst such plants are chrysanthemums, the beautiful hybrid delphiniums, or perennial larkspur, perennial phloxes, pentstemons, and some kinds of salvia. As to planting out any kinds of plants, a great deal must depend on the climate of the particular garden where planting is to be carried on. Roses and all kinds of deciduous plants and hardy annuals may be planted out almost anywhere during the month, and in warm districts evergreens, and even some of the half hardy annuals may be planted. In the cold districts, the planting of evergreens should be put off until the spring, when the ground and the weather begins to warm. Lilium, or lily, bulbs may be planted out anywhere, but in the warm early districts the sooner they are planted the better, for they are likely to start into growth, or may have started already without being planted.

Farm Notes.

Hawkesbury District—July.

H. W. POTTS.

The busiest portion of the sowing season is over, and small areas remain to be dealt with. The prospects for the coming season are more cheery and promising owing to the much-needed rainfall of last month. The early crops were benefited, and this combined with the mild season and absence of frosts have materially altered the gloomy aspect forecasted in previous notes. Grass has been fairly plentiful, and in consequence stock are passing through the early part of winter in good condition.

The rape crops sown in May were light, and, where eaten off, a second growth may now be secured. The main operations on the farm during July will be directed towards getting the land in order for spring crops and the best means in agricultural practice towards the storage of moisture supply for summer. The recent rainfall is sufficiently abundant to ensure the safety of the hay crops. The character of the soil, crop, and its root habit, have to be locally determined in estimating the soil moisture required to promote sturdy and healthy growth. It is usually held that the quantity most favourable to this end is about half the maximum the soil can hold. The aim is in working the land at this juncture to increase with deep ploughing and with free subsoiling the power of the soil to absorb and retain moisture. With our main crop, maize, this important feature must not be overlooked. We must always assume that a dry summer is ahead, and with this deep-rooted plant a good subsoil supply of moisture is an important factor in a maximum growth of stalk and a prolific cob. Where land has been humus fed with a catch crop such as rape or last season's growth of cowpeas, the texture and moisture-holding capacity of the soil, as well as its fertility, will be vastly improved. The turning in of any green growths by a coarse form of ploughing will assist in the object of increasing available plant food. The chemical and biological activities of the soil will be encouraged by the admission of air and water, particularly to the deeper stratas of the soil. This may be allowed to fallow for a few weeks before a finer tilth is attempted. Some attention must be paid to numerous odd jobs about the farm which accumulate during the busy season. Fences and gates have to be repaired, drains, ditches, and watercourses put in order; new land may be broken up, and a general clean-up effected.

Should the early crops of wheat be forced into ear towards the end of the month, they may be eaten off by sheep with advantage, and a top-dressing of 1 cwt. superphosphate to the acre applied to stimulate a second growth.

Barley.—Fresh sowings of Skinless barley may be made to provide green fodder. English and Cape varieties can also be sown for grain.

Oats.—The last of the sowings of Algerian oats can be made all through the month. On the low lands of the Hawkesbury, the best returns are secured with the main crops sown in July.

Rye.—This useful crop is always a stand-by where there is a shortage on the poorer soils of the district for green feed. Continue sowing it all through the month.

Onions.—The young plants are now ready to set out in the beds in sheltered localities.

Field Peas and Tares.—These crops grown alone or in combination with barley or oats are most useful for the dairy farmer at a time in spring when the milk flow requires to be kept up with green succulent forage.

All crops of turnips, Field cabbage, Tree-kale, Jersey kale, and Kohl-rabi will require thinning, clearing, and cultivation to encourage healthy growth.

Rape.—Seeing a crop for eating off can be secured in from eight to ten weeks, it is looked on as one of the safest and most useful of the catch crops. The conditions for further successful sowings this season are most favourable. Rape acts as a subsoiler and replenishes the surface soils with potash and phosphoric acid. The rich, palatable, nourishing character of the foliage is well known. Sheep and pigs thrive well on it. Calves relish it at an early age, as well as steers. The crop, when eaten off with sheep, leaves the ground in good order for maize and sorghum. The land should be selected and the preliminary cultivation made for all early summer crops such as sorghums, millets, pumpkins, marrows, and for the early potato crop.

Shelter Trees and Hedges.

Advantage should be taken of the moist conditions prevailing to plant shelter belts of timber in suitable localities for the protection of stock in summer and winter, as well as to make home surroundings attractive. Shade and ornamental trees can be planted this month. The trees which thrive best in this district are Peppers, Kurrajongs, Silky Oaks, Pines, Maples, Cedars, Camphor Laurels, Planes, Oaks, and Blue Gums. Hedges may also be planted out, such as the Japanese Privets, African Box-thorn, Caffir Apple, Osage Orange, and Honey Locust.

Glen Innes District—July.

R. H. GENNYS.

Oats.—May be sown this month either for grain or hay; they do well on the heavier moister land of the district, which is not so good for wheat and barley. The Algerian variety is rapidly coming into favour; it makes a good

sweet hay, and is a heavy grain yielder. Red Rust-proof is perhaps the best hay sort for New England, and appears to be earlier than any other variety yet tried; it grows a longer straw than Algerian, which it much resembles. White Tartarian is another good yielder, both in straw and grain; it makes hay of a beautiful colour, though not so sweet as Algerian and Red Rust-proof; it is, however, a good chaff sort. Surprise is a fair yielder and good feed oat, and does well here. Danish Island, a really good all round oat, a heavy grain yielder, and good for hay and chaff.

Wheat.—This is a late district, so wheat may still be sown, but sow more thickly than earlier in the season. Jonathan, John Brown, Sussex, and Power's Fife (a Manitoba) are recommended, though the latter, being a late wheat, would be better sown earlier.

Ryes.—These may still be sown for green fodder or grain. Emerald Rye is a good feeding variety; Thousand-fold and White Rye have also done well. The latter is the best for collar-making.

Cabbage, Peas, Cauliflowers may be sown. Plough land a first time for spring crops.

The Orchard.—In New England this is a good month for pruning; if possible it should be finished by the middle of August. Winter spraying should be attended to.

HAWKESBURY AGRICULTURAL COLLEGE.

MONTHLY WEATHER REPORT.

SUMMARY for May, 1907.

Air Pressure (Barometer).			Shade Temperature.				Air Moisture Saturation = 100.			Evaporation (from Water Surface).			
Lowest.	Highest.	Mean.	Lowest.	Highest.	Mean.	Mean for 15 years.	Lowest.	Highest.	Mean.	Most in a Day.	Total for Month.	Monthly Mean for 9 years.	% of the year's Evaporation.
29·83 2nd.	30·47 16th	30·24	28·9 24th.	78·3 7th.	55·84	56·57	42 1st.	100 15th. 18th, 19th, 20th, 29th, 30th.	84·7	·157 2nd.	2·113	2·237	4·5

Rainfall... { Points .. 46 | ½ | 1 | 10 | 2 = 59½ points.
Dates ... 3 | 4 | 17 | 30 | 31

Mean Rainfall for 15 years. 203 points.

Wind ...	N	NE	S	SW	W
	4	2	6	5	5

Thunderstorm, 16th.

Greatest daily range of temperature, ?8·5° on 21st.

Days on which temperature fell below 42° ...

37·5	40·4	36·5	37·4	41·5	39·0	32·0	28·9	33·7	35
1	2	11	12	20	21	24	25	26	27

Remarks.—A dull, but very dry month.

W. MERVYN CARNE,
Observer.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Sub-Editor not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1907.

Society.	Secretary.	Date.
Hay P. and H. Association	C. S. Camden ...	July 24, 25
Condobolin P. and A. Association	W. Maitland ...	" 30, 31
Forbes P., A., and H. Association	N. A. Read ...	Aug. 7, 8
Narrandera P. and A. Association	W. T. Lynch ...	" 7, 8
Royal Agricultural Society of New South Wales—Grand Horse Parade and Sales.	H. M. Somer ...	" 7, 8, 9, 10
Gunnedah P., A., and H. Association	M. C. Tweedie ...	" 13, 14, 15
National A. and I. Association of Queensland ...	C. A. Arvier ...	" 13 to 17
Parkes P., A., and H. Association	G. W. Seaborne...	" 14, 15
Murrumbidgee P. and A. (Wagga Wagga)	A. F. D. White ...	" 21, 22, 23
Northern Agricultural Association (Singleton) ..	C. Poppenhagen ..	" 21, 22, 23
Grenfell P., A., and H. Association	Geo. Cousins ...	" 27, 28
Junee P. A. and I. Association...	T. C. Humphrys ..	Sept. 4, 5
Cowra P., A., and H. Association	E. A. Field ...	" 4, 5
Albury and Border P., A., and H. Society	W. J. Johnson ...	" 10, 11, 12
Young P. and A. Association	G. S. Whiteman...	" 10, 11, 12
Cootamundra A., P., H., and I. Association ...	T. Williams ..	" 17, 18
Wyalong District P., A., H., and I. Association ...	S. G. Isaacs ...	Oct. 1, 2

1908.

Society.	Secretary.	Date.
Dapto, Unanderra, A. and H. Society	Geo. Lindsay ...	Jan. 8, 9
Albion Park A., H., and I. Society	H. G. Frazer ..	" 15, 16
Berry Agricultural Association...	A. J. Colley ...	" 21, 22, 23
Alstonville A. Society	Wm. W. Monaghan	Feb. 12, 13
Camden A., H., and I. Society	A. Thompson ..	" 19, 20, 21
Campbelltown A., H., and I. Society	A. R. Payten ...	" 26, 27
Bega A., P., and H. Society	W. A. Züegel ...	Mar. 4, 5
Yass P. and A. Association	Will. Thomson ..	" 4, 5
Tenterfield P., A., and Mining Society	F. W. Hoskin ...	" 4, 5, 6
Gundagai P. and A. Society	A. Elworthy ...	" 24, 25
Walcha P. and A. Association	S. Hargraves ..	Apl. 2, 3
Upper Hunter P. and A. Association (Muswellbrook)	Pierce Healy ...	" 8, 9, 10
Deniliquin P. and A. Society	L Harrison ...	July 18, 19

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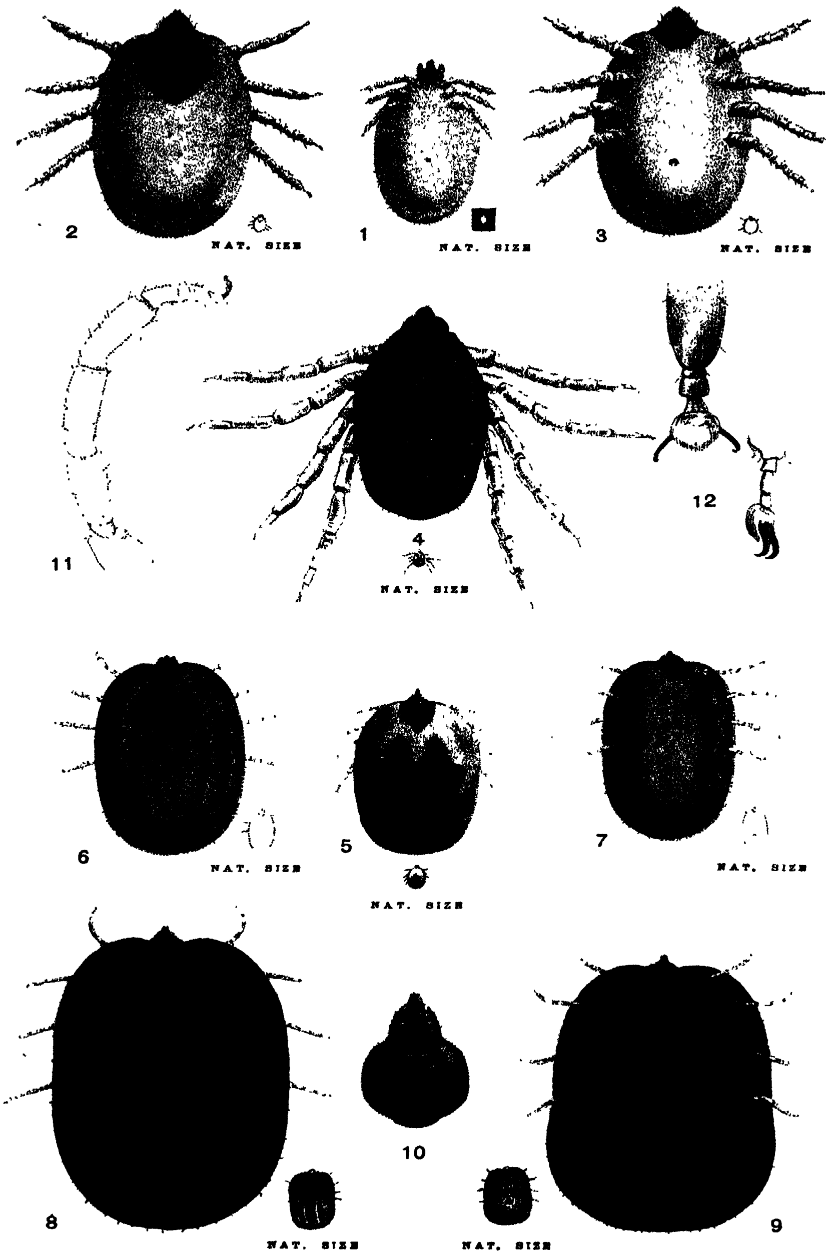


THE CATTLE TICK (BOOPHILUS AUSTRALIS).

1. Larval Tick.
2. First Moult Tick (Dorsal View).
3. ,, ,, ,, (Ventral View).
4. Male Tick (Adult).
5. Young Female Tick.
6. Medium-sized Female (Dorsal View).
7. Medium-sized Female (Ventral View).
8. Fully-matured Female (Dorsal View).
9. ,, ,, (Ventral View).
10. Head Shield.
11. Leg (Much Enlarged).
12. Terminal Digits (Much Enlarged).

VOL. XVIII. PART 8. AUGUST 2, 1907.

Agricultural Gazette of New South Wales.

The Cattle Tick: Tick Infestation, Tick Fever, Preventive Measures, and Treatment.

[Continued from page 570.]

JAS. D. STEWART, M.R.C.V.S.,
Government Veterinary Surgeon.

IV.

The Dipping of Stock.

DIPPING is best carried out during fine weather, as early in the morning as possible. The stock should be well rested and not in want of food or water. Mustering and yarding should proceed quietly. Once dipping is started the yards and race should be kept full, and the animals admitted into the dip one after another, any rushing being controlled by judicious working of the entrance gate. Stubborn beasts are forced into the dip by pulling upon a rope passed under their tails. As a rule, if the supply is well maintained, the animals follow each other and plunge into the solution, become totally submerged, and, on rising, swim to the exit, up which they quietly climb to the draining yards. It sometimes happens that a beast manages to escape complete submersion and keep the poll of its head dry. To meet these cases, which are of very rare occurrence, a bucket full of the solution should be conveniently kept beside the dip towards the exit, to be poured over the head of any beast that has not been properly wetted during the plunge.

In the draining yard the animals are detained until the solution ceases to drip from them, when they are released into a paddock and held until returned to their pastures. When large lots are being treated the alternate use of two draining yards saves much time, for as one is filled the animals in the other are ready for release.

It is always advisable, whenever practicable, to rest stock that have been dipped, on good pasture for two or three days after treatment, as immediate travelling intensifies slight ill-effects, and often causes them to produce serious illness. Generally speaking, our experience has been that quiet stock in good condition dipped in standard solution without undue excitement, and subsequently spelled in a good paddock, suffer little or no ill-effects from the treatment, even when repeated three times, with intervals of less than fourteen days. It is, however, always advisable to allow an interval of more than eight days to elapse between each dipping.

Effects of Dipping.

On the Tick.—The result of dipping in arsenical solutions is not immediately noticeable. On the second or third day after treatment the great majority of infesting ticks will be found yellow and shrivelled, and by the fourth or fifth day the animals are "apparently free of living ticks," providing reinfestation has not occurred. The term "apparently free of ticks" is used advisedly, and is intended to convey that no ticks are seen on an animal on an ordinary paddock examination. A closer examination, as can be obtained in the "bail" or by throwing the beast, however, sometimes reveals the existence of one or more live and vigorous ticks. The positions where these surviving ticks are usually found are about the tips of the ears and places where they are protected during dipping, by skin folding upon them, as under the root of the tail, on the borders of the eyelids, &c. In these instances, it is held by Queensland officials that while the quantity of arsenic absorbed by the surviving ticks has not been great enough to kill them, it has been sufficient to affect their procreative propensities and prevent their eggs from hatching out. We have not yet been in a position to confirm this view.

On the Stock.—Even as soon as the day after dipping, cattle and horses that were grossly infested are noticed to rest more leisurely and commence to thrive and put on condition. Their coats become clean and soon regain natural lustre, while the tick-wounds and parts where the skin has sloughed become dry and begin to heal. The enlarged superficial lymphatic glands gradually return to normal size, and the dropsical swelling of pendant parts disappears. Subsequent improvement necessarily depends upon the degree of infestation of the pastures and the intervals allowed to elapse between the dippings.

It is unfortunate that we should be compelled to employ for the destruction of infesting ticks a poison like arsenic in the dipping solutions, as its use is necessarily attended by a certain risk to the animals treated. The degree of risk, however, is dependent upon the composition of the solution, the docility and condition of the animals, the absence of accidents, together with the management the stock are subjected to before, during, and after dipping. Consequently, the fatality of dipping varies considerably; but with strong stock dipped in properly prepared solution, under good management, it seldom exceeds one in a thousand. With handled stock, such as dairy cattle, fatality is still of rarer occurrence. Occasionally, however, accidents occur leading to greater fatality. The ill-effects directly traceable to the dipping solution are scalding and arsenical poisoning.

Scalding is mostly seen in travelling stock, low in condition, dipped during hot, dry seasons. As is well known, some beasts will scald if swum over a river on a bright hot day and immediately travelled. Still, scalding may be caused by dipping and immediate travelling during the heat of the day, and particularly when inferior or adulterated Stockholm tar is used, or the solution becomes concentrated or excessively alkaline

and caustic in nature. Light-coloured stock suffer more severely than darker ones. The parts usually affected are inside and between the thighs and about the breast and forearms. The thin skin covering these parts becomes dry, hard, and often fissured. As a result, badly-affected animals suffer on being moved, "tongue" painfully, and quickly knock up. A few days' rest in a good pasture usually brings about speedy recovery. Severe cases may be treated, when practicable, by applying an antiseptic emollient, such as carbolised oil or vaseline, to the parts.

The absorption of arsenic by the skin of cattle and horses is so slight that it amounts to a negligible quantity, as far as dipping in standard solutions is concerned. Consequently, for the arsenic to exercise its poisonous effects it is necessary for the solution to gain access to the animal's system through the nose or mouth. Unfortunately this does occur in some instances, and mostly to refractory beasts, although it occasionally happens to a quiet one that has apparently gone through the dip in a satisfactory manner. The ill-effects that follow are dependent upon the strength of the solution, the quantity taken in, its lodgment in the system, the constitution and condition of the animal and subsequent management. Should the solution be of standard strength, and the quantity taken into the stomach not be more than a pint in the horse and a quart in cattle, it is unlikely that any serious illness will follow. Even this amount might be exceeded without grave consequences if the beast is strong and its stomach full of food, as the contents of the stomach absorbs the solution and reduces its activity. Consequently, cattle withstand the effects of larger quantities than horses. In all cases the seriousness of the effects is greatly reduced by resting stock for a day or two after dipping in paddocks containing green feed, good shelter, and water easily accessible. On the other hand, as previously pointed out, exhaustion by hurried or long journeys, want of food and water, intensifies the ill-effects stock suffer from dipping.

When a sufficient quantity of the solution gains access to the stomach and bowels it causes gastro-enteritis; if to the lungs, broncho-pneumonia. Both these affections may be but mild, or they may be sufficiently severe to produce death.

Gastro-enteritis, or inflammation of the bowels, is always more severe in animals dipped on an empty stomach. The condition is manifested in its acute form by great abdominal pain similar to colic, depression, hurried breathing, diarrhœa, and a small rapid pulse that is sometimes irregular.

Treatment.—In the dog the solution itself incites vomitation, and recovery speedily follows. As it is impracticable to induce vomitation in either horses and cattle, this ready method of getting rid of the poison cannot be taken advantage of. Consequently, it is necessary to resort to drenching the affected beast with a chemical antidote—that is to say, certain drugs are given which combine with the arsenic and convert it into an insoluble or inactive form. The best preparaton is *Antidotum*

arsenici. This is made by well mixing immediately before use ferric chloride, 3 parts; water, 17 parts, with calcined magnesia, 1 part; water, 19 parts. Doses of 1 pint of the mixture should be given until symptoms are relieved. More convenient and almost as effective remedies are 1 pint of dialysed iron in a quart of water, or half a pound of sesquioxide of iron mixed in warm water, or magnesia in large quantities. If these are not handy, castor oil, raw linseed oil, or any sweet oil or butter may be given frequently and in relatively large quantities. Acute symptoms may be relieved by tincture of opium in 1 to 2 oz. doses in half a pint of milk or thin gruel, or by a hypodermic injection of morphine hydrochlorate in doses up to 5 grains. Weakness and threatened collapse may be combated by the administration of spirits. During convalescence, food of a succulent easily-digested character should be given sparingly.

Broncho-pneumonia signifies inflammation of the air-tubes and lungs. It is always a serious affection in large stock, and may be recognised by the following symptoms, *i.e.*, prostration, fever, rapid pulse, blood-shot eyes, rapid and laboured breathing, painful irritable cough, and mucous discharge from nose.

Treatment.—With unbroken stock all that it is practicable to do is to apply a quick-acting blister, such as mustard and turpentine, to the sides of the chest, and let the animal remain undisturbed in the open under favourable conditions with respect to shelter, food, and water. With animals that can be handled, in addition to the application of a blister, the administrations of diffusible stimulants and febrifuges every three hours, medicated inhalations, the clothing of the body and bandaging of legs can be carried out.

It is, however, always advisable to engage the services of a trained veterinary surgeon, when obtainable, for the treatment of all poison cases, as so much depends upon the symptoms manifested that it is not possible to give other than the general principles of treatment in an article of this kind.

Necessity of repeating Treatment.

The fact of the cattle-tick taking about twenty-one days to develop upon the host allows of ample opportunity for its destruction before it matures. If eradication is aimed at, it is obvious that effective treatment must be systematically carried out well within that period. The intervals allowed to lapse between the last treatment vary according to the efficaciousness of the method adopted. For instance, hand-picking and grooming should be practised daily; smearing or spraying every seventh day; and dipping about every fifteenth day. The period it is necessary to continue treatment depends upon the degree of infestation of the pastures and climatic conditions. The tendency, however, is for owners to stop treatment too soon, with the result that eradication is often approached but never accomplished. Consequently, it is recommended as

a safe practice that treatment should be prolonged for at least two months after the last tick has been picked up, and the herd kept under close surveillance for some time subsequently.

In some countries, owing to the vast extent of the cattle runs, the absence of fencing, and other difficulties in handling the thousands of cattle there, which are usually more or less wild, many cattle stations are regarded, for all practical purposes, as permanently infested. Consequently, some dip the stock only when they are threatened with tick-worry, others just often enough to keep the pest in check. In localities where "tick fever" is rife and the eradication of the tick is hopeless under prevailing conditions, the existence of a few ticks is regarded as desirable to perpetuate immunity to the fever, which would otherwise have to be conferred by inoculation—a process that would involve a considerable amount of labour and expense. But with smaller herds capable of being handled with facility there exists no justification for the perpetuation of the tick pest. Insidious as the pest may be, it is difficult to accept the pessimistic view that it will not in time succumb to systematic and sustained efforts vigorously carried out and loyally supported by those immediately concerned.

(To be continued.)

Cattle Tick Infestation, &c.

NOTE.

In last month's *Gazette*, page 567, the formula as supplied by Mr. Stewart was incorrectly transcribed. The correct formula is as follows, there being double the quantity of soda and soap to that mentioned:—

Arsenic (AS_2O_3)	8 lb.
Washing soda (Na_2CO_3)	12 lb.
Common hard soap	2 lb.
Stockholm tar (best)	1 gallon.
Water added to	400 gallons.

Forestry.

Some Practical Notes on Forestry suitable for New South Wales.

[Continued from page 518.]

J. H. MAIDEN,
Government Botanist and Director of the Botanic Gardens, Sydney.

XVII—*continued.*

Conifers.

IV.

CONIFERÆ.

Tribe—Cupressineæ.

Sub-tribe 2.—*Thuinæ.*

2. Fitzroya.

Female amenta of 2 pairs of opposite scales, with two erect ovules at the base of each of the inner ones, not materially altering in the fruiting condition. Seeds, 3-winged.

(1.) *F. Archeri*, Benth. and Hook. f.

An erect branched shrub of 4–5 feet on mountain tops in Tasmania, *e.g.*, Mount Pelion, Adamson Peak, Mount La Perouse, Mount Dundas, &c. (Rodway).

In Veitch's Manual it is spoken of as "a low tree with a trunk sometimes 15–18 inches in diameter, more frequently a much-branched erect shrub 5–12 feet high." So that it appears to grow much taller in England than in its native habitat. It can only be expected to succeed in the coldest parts of New South Wales.

(2.) *F. patagonica*, Hook. f.

See *Bot. Mag.* t. 4616.

Native of the western slopes of the southern Andes. It attains its greatest development in southern Chili, where it is a tree of 100 feet and more.

It is not a satisfactory subject for British gardens, and will be difficult to manage here, but in view of its great botanical interest (allied as it is to a Tasmanian species) it is well worthy of trial on the southern Monaro.

Callitris.

For some reason which is not clear to me, the genus *Callitris* (*Frenela*) is omitted from Veitch's Manual.* It is the genus which consists of our Cypress Pines, so enormously developed in Australia. The closely allied and less important genus *Actinostrobus* is also omitted.

---

* Sub-tropical and even tropical species of *Araucaria* are dealt with in that work.

The position of both genera is next to Fitzroya, where I have inserted them.

I have figured the Cypress Pines in Part 12 of my "Forest Flora of New South Wales,"* and have dealt with them so fully that I do not intend to

Callitris robusta, R.Br.
Near Wagga Wagga, N.S.W.

repeat myself here. The following Cypress Pines may be enumerated, and they are so beautiful and so obviously suited to various Australian soils and

* Government Printer, Sydney; price, 1s. per Part.

climates that they should be extensively planted both for ornamental and economic purposes. The timber is usually highly figured and full of resinous matter. It is especially resistant to white ants. It is short in the grain, and is deliciously aromatic.

Callitris cupressiformis, Vent.
Port Jackson.

Its resin, "Australian Sandarac," is in no way different from the Sandarac of North Africa, a valuable product.

(1.) *C. Macleayana*, F.v.M., is the "Port Macquarie" or "Stringybark Pine." It is a tall, handsome tree, and grows in coastal New South Wales (from Stroud northwards) to northern Queensland.

It is remarkable for its fibrous (stringy) bark, and for the comparative absence of figure, a rare occurrence in the genus.

(2.) *C. verrucosa*, R.Br. "Mallee Pine" or "Warty-fruited Pine." This is a small species found in the interior of Australia. It is therefore suited to arid country. Its large warty fruits are quite handsome.

(3.) *C. robusta*, R.Br. The "White or Murray Pine."

It bears other local names, given because of its varied localities.

It is a dry country species, extending, however, a considerable distance east.

It is a beautiful tree, shapely, and its glaucous foliage contrasts well with that of other trees. It is the principal constituent of the Pine scrub of the West.

It will succeed nearly all over the State, and those in search of a beautiful Australian species for their garden are recommended to try it.

(4.) *C. columellaris*, F.v.M.

A picturesque species growing on the Northern Rivers and in coastal Queensland. It attains a large size, and its habitat indicates it as suitable for coastal planting in New South Wales. When growing in maritime situations the lateral branches are often as large as those of the main stem.

(5.) *C. Muelleri*, Benth. and Hook. f. "Blue Mountain Pine."

So called because it is found on the Blue Mountains; it occurs in other mountainous country in New South Wales.

It is a beautiful species, of medium size, sturdy, with bright green foliage, and will stand a considerable amount of cold.

(6.) *C. propinqua*, R.Br.

This is a species allied to *C. Muelleri*, but with very large cones more or less warty. Its range is extensive; it attains a fair size, and is well worthy of a place in a large garden. Found in New South Wales, Victoria, and South Australia.

(7.) *C. calcarata*, R.Br. "Red or Black Pine."

It has a good deal in common with *C. Muelleri*, and, indeed, the latter may be a form of it. It obtains its name because of its dark colour in comparison with the white (glaucous) appearance of *C. robusta*; the colour of the timber of *C. calcarata* is also usually much darker than that of *C. robusta*.

C. calcarata extends over an enormous area in New South Wales, frequenting rocky country often in the driest country, and ascending into New England and other places where the winter cold is very severe.

(8.) *C. cupressiformis*, Vent. "Port Jackson Pine."

A graceful species common in Middle Harbour, Port Jackson, and now rare in parts of Port Jackson where it was formerly common. It extends to most of the other States, but chiefly near the coast; in Victoria it is an inland species, and in New South Wales it occurs near the summit of the Blue Mountains. It is found also on Kangaroo Island, South Australia.

3. Cupressus. "Cypress."

"The genus Cupressus includes some of the most beautiful and interesting trees in Nature, and as the majority of the species are more or less hardy in Great Britain, their value as subjects for garden decoration is very great, a value greatly enhanced by the numerous abnormities into which many of them have diverged under cultivation, and which has resulted in the 'fixing' of forms of very distinct habit and aspect originating from the same species. The most remarkable instances of polymorphism occur in *Cupressus Lawsoniana*, *C. obtusa*, and *C. pisifera*, of which it may be remarked that the abnormities of the one for the most part simulate those of the others, thus affording evidence of order and method in the production of an apparently inexplicable diversity of forms." *—(Veitch's Manual.)

See also "A general view of the genus Cupressus" (Masters), *Journ. Linn. Soc.*, xxxi, which includes a useful list of synonyms. Masters divides the genus into two sections, viz. :—

(*a*) "*Eucupressus* —Strobiles large, attaining maturity in the second year; scales ligneous, each bearing numerous seeds in one–two series. Herbaceous branch systems tetrastichous (four-ranked) but often obscured from external causes, sometimes distichous (two-ranked). Leaves mostly homomorphic :

"*Arizonica, Benthamii, funebris, Goveniana, lusitanica, Macnabiana, macrocarpa, sempervirens, thurifera, torulosa.*

(*b*) "*Chamæcyparis.*—Strobiles small, attaining maturity the first year; scales coriaceous, bearing two, rarely three–five seeds in one series. Herbaceous branch systems distichous, tetrastichous in some of the abnormal forms only. Leaves dimorphic, the lateral pairs more or less conduplicate, the dorsiventral pairs flat :

"*Lawsoniana, nootkatensis, obtusa, pisifera, thyoides.*"—(Veitch's Manual.)

(1.) *C. arizonica*, Greene.

A tree usually 30–40 feet in height, but occasionally much larger.

Common in Arizona, U.S.A., at an elevation of 5,000–8,000 feet. Introduced into British gardens in 1882 from the Arnold Arboretum. Speaking of Britain, Veitch's Manual says :—

"The young trees growing in this country are of fastigiate or columnar habit, with a lightish green foliage; (Thornber speaks of its "characteristic bluish-green foliage and pleasant aroma."—J.H.M.) They have up to the present time proved quite hardy, and are among the best of decorative Conifers for the lawn and small gardens." It is adapted for arid and exposed situations.—(Thornber).

It seems worthy of introduction into New South Wales, and I am trying it.

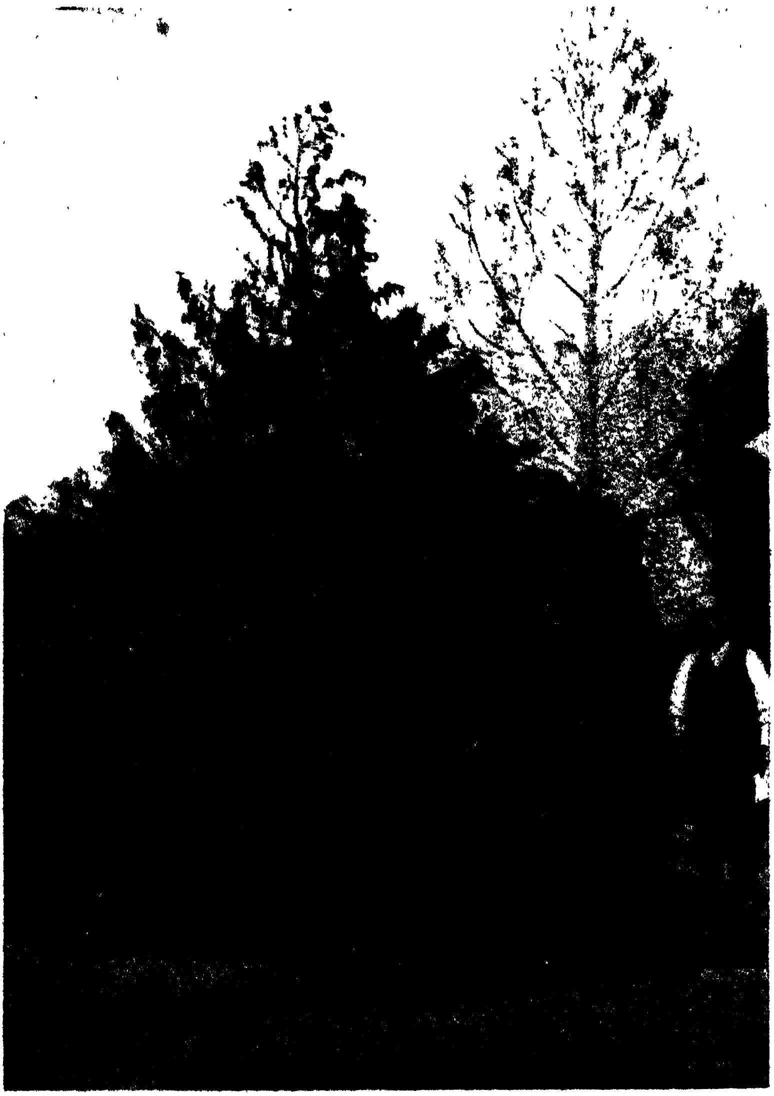
(2.) *C. Benthamii*, Endl. "Bentham's Cypress."

A tree of variable habit and dimensions according to situation and environment.

* It should, however, be noted that whilst many of these abnormities may become "fixed" by propagation from cuttings and by grafting, many others lose their peculiar form and colour as they increase in age, the reversion to a normal type taking place more rapidly in some varieties than in others.

It is a native of the *tierra fria* or alpine region of Mexico, at 6,000 feet elevation and upwards. It does very well in eastern New South Wales.

L 6, 33 c (Sydney Botanic Gardens).



Cupressus funebris, Endl.
State Nursery, Campbelltown.

"Var. *Knightiana* differs from the typical *C. Benthamii* in its more symmetrical habit, especially in the regularity of its branching, in its glaucescent foliage, and also in the more prominent umbo of the cone scales."—(Veitch's Manual.)

L 1 (Sydney Botanic Gardens).

(3.) *C. funebris*, Endl. "Funeral Cypress."

See Masters in *Journ. Linn. Soc.*, xxxi, 337, with figures.

A tree of singular aspect, with a broadly pyramidal crown, wide spreading branches and pendulous branchlets, attaining a height of 50–60 feet. It is planted in the vicinity of tombs in China, of which country, as well as the Himalayas, it is a native.

It does well in the Sydney district.

M 19, L 7, 8, 15 a, 17 e, 30 (Sydney Botanic Gardens).

Cupressus Goveniana (young plant).
State Nursery, Campbelltown.

(4.) *C. Goveniana*, Gordon.

Figured by Masters, *Journ. Linn. Soc.*, xxxi, 346; also by Sargent, t. 527.

A Californian species, ascending from the coast to an elevation of 3,000 feet.

A tree occasionally 50 feet high.

It is a very fragrant plant; does well in the Sydney district.

L 6 (Sydney Botanic Gardens).

(To be continued.)

Hawkesbury Agricultural College and Experimental Farm.

Construction of Pig-sty Buildings.

A. BROOKS,
Foreman of Works, Hawkesbury Agricultural College.

We are told that there is no animal on the farm that is more likely to suffer from colds, caused by lying on damp floors or in draughts, than the pig; and yet there are none that are, as a rule, so carelessly provided for with buildings. Anything seems to be thought good enough for a pig-sty, either in design or construction; and, in fact, few indeed can be said to have any design about them at all. I do not wish to convey to our farmers that I advocate the building of stylish-looking or expensive buildings for the housing of the pigs, but to show that, if they wish to breed for profit, it is necessary to provide proper and suitable housing accommodation.

To spend £10 on building a sty for an animal that will return you £50, or perhaps £100, cannot be said to be throwing away money on buildings, and the sty will be there for the lifetime of a few more pigs of like value. I may be permitted to state here, for the benefit of those who may think that we construct our buildings on a rather more expensive scale than the average farmer can afford to do, that what makes the cost seem so much is the fact that we have to pay the highest market rates for every inch of material used and for the labour employed in their construction. Anyone who may be fortunately situated in good timber country may be able te erect similar buildings at a very much less cost of cash out of pocket. For many portions of the work, several of our bush timbers split up would make equally good work, and would cost very little in comparison to what we pay for sawn timber here.

Comparative Designs.

The class of sty usually provided for the pig is placed in a corner of the yard, and consists simply of the posts and rails (round saplings usually) for walls, and a few sheets of bark for covering, but no floor. The trough may be either a half hollow log, with ends nailed on, or a log mortised out of the solid lying in another part of the yard, and half buried in the soil. Now, with such material at hand, if there is plenty of it, a very much better pig-sty could be built if a little thought were given to some design before beginning to construct it. A pig housed in such a place as I have described cannot give as good results for the feed it consumes as another more comfortably housed, and, to the man who is rearing pigs for profit, this should be a serious consideration. The points necessary to be considered in designing pig-sties are to arrange them so that feeding and cleaning may be done with the least possible amount of labour; and to secure this, we must have good

floors, laid with fall towards the feeding troughs, giving good drainage, walls sufficiently strong and high for the class of pig to be housed—boars require higher and stronger walls than sows, the former 4 ft. 6 in. to 6 feet, the latter 3 ft. 6 in. to 4 feet high—and, if possible, the lower portion of the walls should be of such materials that will not injure with wetting. The troughs should be constructed and so placed that the feed can be taken out clean, and that they can be washed out occasionally. The drainage should be conducted as far as possible in open drains, certainly over the building itself, and so shaped that the broom and shovel can be used freely and effectively, and sunlight admitted. The doors of the sties should be ledged and braced, and provided with strong fastenings; the troughs with swinging flaps hanging over the centre, so that the pig can be shut off from them when the feed is being put in, and all ledges and projections should, as far as possible, be avoided on the inside of the sties, so that dirt and water cannot lodge on them, and there will be free scope for the lime-wash brush, which should be used often.

The last, but not the least, necessary feature is that the roof should be high enough to give plenty of head room and good ventilation. Nothing is so likely to make a man shun the job of lime-washing or cleaning out a pig-sty, or, in fact, any other building on a farm, more than if he cannot find room enough to stand up in it to do the work.

Now, all these good points can just as easily be embodied in the design of a single pig-sty as they can be in the various buildings required by the man who goes in for pedigree breeding. These may be classed as:—

Sties for boars only. Sties for sows with suckers.
Sties for sows only.

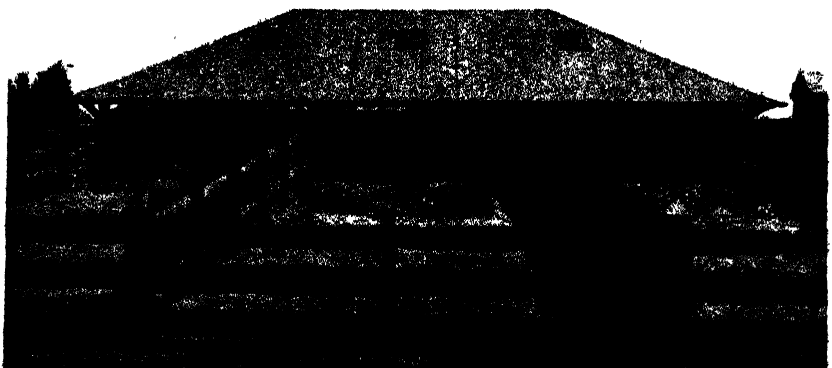


Fig. 1.—Boar house, south elevation.

Materials to build with.

Undoubtedly, if they could be had at reasonable cost, nothing better could be used than bricks for walls and floors of pig-sties; the next best materials are bricks for floors and timber for the walls. The price at which

the materials can be delivered must be the first consideration, together with the cost of the necessary labour; but I should not advise brickwork if the bricks cost more than 35s. per 1,000. I have said bricks for floors in preference to stone and cement-concrete with a top dressing of cement and sand rendering, because, first, the bricks can be put down at less cost, and then they can be repaired much more easily, and better, and take much less water to clean off—another big consideration where water is not supplied from a town main. All woodwork for the walls should be hardwood, and, if possible, the roof should be constructed of pine, so as to make it as light as possible; then you need not cover with corrugated iron, there being several good roof-covering materials in the market, such as the Ruberoid and Malthoid. Of course, as to whether buildings last and wear few or many years depends, in the first place, as to whether they are substantially constructed, and then whether they are cared for afterwards, by repairing and painting when necessary, instead of allowing them to get into a very bad state before anything is done.

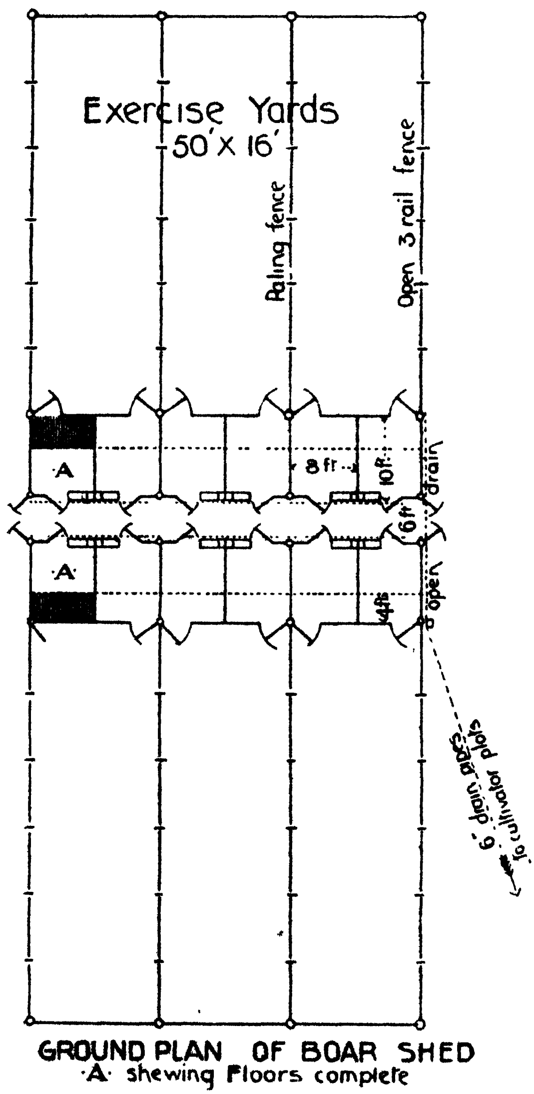


Fig. 2.—Boar house, ground plan.

Fig. 1 shows our new boar-house, looking south, three of the boars being out for exercise. The ground plan (Fig. 2) shows the arrangements of the sties, troughs, passage, and exercise yards. This building contains twelve sties, measuring 10 feet clear from front to back, and 8 feet wide, the bedding floors being 4 feet wide at the back wall. The feeding

troughs are arranged on each side of the centre passage, which is 6 feet wide; and each sty is drained to the passage, so that no water can lie on the floors. These drains are constructed so that very little of the drainage is ever visible in them; and they have a fall equal to 1 inch for each sty. All obstructions to the free flow of the drainage are carefully avoided, the doors and walls in the passage being 2 inches clear of the floors.

The floors are laid with brick paving, grouted with cement in the joints, and laid with a fall of 4 inches in the length of each sty, the passage floor being rounded 2 inches in the centre, which forms the surface drains at each side. The bedding portion of the floors is laid with 3-inch thick hardwood thoroughly coated with boiling tar, and spiked to bearers set in concrete 4 inches thick underneath (see section of building, Fig. 3). The walls, 12 inches high over the floors, are of 4½-inch brickwork set in cement, and over that are constructed with 3-inch thick hardwood framing, filled in with 1-inch thick hardwood, upright boards, the full height being 5 feet on outer and 4 ft. 3 in. on inner walls. The boards are fitted in grooves, so that when they shrink (as they are bound to do) they can be closed tightly together, and a closing piece put in. The troughs are of brick and cement, and provided with a separate compartment for clean water. There are also swinging flaps over the centre of each, and outlets with tapered plugs emptying on to open gutters in passage. The details of this are very clearly shown in the photograph of the passage (Fig. 4). The roof is constructed of Oregon timber, rafters being 5 in. x 2 in. set at 34-inch centres, and boarded with ¾-inch boarding, and covered with "Malthoid," which makes the roof light and cool. On the north elevation are placed roof lights (three), to admit the morning sun, and to light up the passage. The eaves of the roof are 7 feet high and project 2 ft. 3 in. over the walls to keep out the driving rains. The yards are fenced 4 ft. 6 in. high, with three rails and barb wire on the outside lines, and two rails and split palings bound with hoop iron on the inner lines.

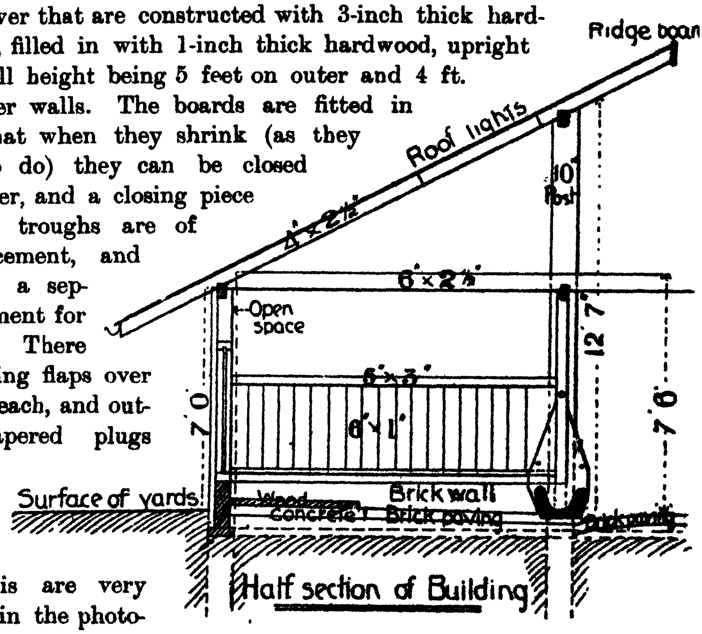


Fig. 3.—Half section of building.

It will be noted that there are only three yards for the six sties on each side, so that only three of the boars can be let out for exercise, while the others are fastened up. We can thus give more room to the boar that is out

than he would have if we divided the space into six yards, to allow each to be out at any time. A reference to the fasteners provided on the yard door

Fig. 4.—Finished passage-way, showing troughs and doors of boar-house.

Fig. 5.—Outer doors and fasteners.

(marked FC on Fig. 5), will show that neither the boar in the yard nor the one in the sty can manage to open them. The cost of this building may be put down at £130, and fencing another £30, or a little over £13 per sty.

(To be continued.)

Experiments with Potatoes.

A. H. E. McDONALD,
Experimentalist, Hawkesbury Agricultural College.

During the past season an experiment was conducted with the following objects:—

I. To ascertain the value of farm-yard manure when used alone.

II. To determine the effect of omitting to supply one or more of the essential plant-food constituents.

III. To determine the value of chemical fertilisers when applied in conjunction with farm-yard manure.

The soil selected for the trial was a light sandy loam, rather lower in fertility than typical potato soil, but richer, and in better mechanical condition than most of the College land. It had been cropped with turnips in the early part of the year, but owing to the insufficient rainfall, the crop was a failure, and was ploughed in. Peas had been planted previous to the turnips, and the vines ploughed under after a crop of seed had been harvested. Two ploughings were given, and the soil well worked down by harrowing and rolling to bring it to the fine mellow tilth so favourable to a good growth of the potato crop.

The area used was divided into two sections, A and B, each $2\frac{1}{2}$ chains long and 2 chains wide. In section A farm-yard manure and artificial fertilisers were used, and in section B artificial fertilisers alone. By adopting this plan five drills $2\frac{1}{2}$ chains in length, taking up one-twentieth of an acre, were obtained for each plot. Accurate results could, therefore, be relied upon, little, if any, diffusion of the manure being likely to occur between adjacent plots.

The variety chosen was Brownell's Beauty, and planting was done on 24th August. Before sowing the potatoes were steeped for two hours and a half in a solution of $2\frac{1}{2}$ oz. of corrosive sublimate to 16 gallons of water, as a preventative against scab. After drying they were cut into sets of approximately 2 oz. each, and dipped in slaked lime, as a precaution against rot. The drills were run out 2 ft. 7 in. apart and 4 inches deep. Where fertilisers were used they were spread carefully along the drills to obtain an even distribution throughout. The sets were dropped 14 inches apart, and covered by lightly harrowing with a lever-harrow, having the teeth set well back. Just previous to planting, a light shower of rain had fallen, and the soil was in a moist, friable state, forming an almost perfect seed-bed. Germination was rapid, the plants appearing in three weeks, and the stand proved extremely good. When they had grown 3 or 4 inches, a light harrowing was given to destroy young weeds and check evaporation. This harrowing was of great benefit to the crop, as it destroyed large numbers of young weeds in the rows, and saved an immense amount of hand-hoeing later. By loosening the surface it formed a fine earth mulch which is very useful in breaking the capillary tubes in the soil, thus preventing the loss of much valuable moisture by evaporation. It was succeeded at intervals by

scufflings b tween the rows with a Planet Jr. Cultivator until the plants flowered, when side sweeps were put on the cultivator, and the crop hilled up.

The chemical fertilisers were supplied by Mr. J. M. Hattrick, of the agricultural offices of the Potash Syndicate.

The season was very unfavourable to the growth of all farm crops, and the yields were small, but the results were much better than those obtained from the majority of the potato crops in the district. Many of those grown on even the richest land were complete failures, and were ploughed in.

The following rainfall was registered during the growing season. A marked feature is the lightness of the individual records.

August.		September.		October.		November.		December.		January.	
Dates.	Points.	Dates.	Points.	Dates.	Points.	Dates.	Points.	Dates.	Points.	Dates.	Points.
6	1	1	1	1	26	3	3	6	2	2	13
9	6	3	7	2	3	8	9½	9	2½	9	1
11	2	4	2	3	20	12	6	12	16	15	9
18	17	5	1	4	53	13	8	13	1	18	3
19	37	6	1	5	3½	14	57	18	29		
20	5	10	2	9	12	15	2	19	3		
27	1	11	6	22	2½	27	38	20	1		
30	68	13	4	31	61	28	34	25	42		
31	153	15	29½			29	5	28	7½		
		22	32								
		23	4								
		24	2½								
		30	3								
	290		95		181		162½		104		26

A total of 8·58 inches.

Much of this rain was followed by drying winds, which prevented the crop from receiving the full benefit from it. The fall for the whole year only amounted to 17 inches, constituting the lowest record obtained in the district over a period of forty-four years. At no period was the subsoil in a saturated condition.

Thus in addition to demonstrating the advantage derived from judicial manuring of the crop, the experiment clearly indicates the value of the adoption of a system of good cultivation, timely sowing, and the use of sound potatoes for seed purposes. These were the main factors which contributed to the results obtained, and it is only by their aid that consistent results can be relied upon. In the present season care was taken to have the land prepared at an early date, so that the most favourable opportunity could be seized to get the crop sown. Consequently a light shower of rain received in the early part of August, placed the prepared soil in a suitable condition, the work was proceeded with at once, and the crop was able to take full advantage of a later heavier fall. Where preparations had not been made earlier in the season for sowing, the work could not be done until after this rain, and the crops were therefore late in getting a start. This handicapped their growth considerably, as they had not the same vigour as the earlier crops, nor the same power of withstanding drought. The time of sowing made all the difference between moderate success and failure, and whereas in the one case up to 2 tons per acre were harvested, in the other the land did not return the seed sown. From this it is not contended that

the best results will always follow early planting, but it shows the advantage of having the ground prepared seasonably so that sowing can be done when the soil and weather conditions are most favourable. As a general rule it may be stated that in warm districts, the sooner planting is done after danger from frost is over, the better chance the crop has of success. When good rains are experienced during the winter months, a large amount of moisture becomes stored up in the subsoil, and by judicious cultivation, can be retained to be drawn upon by the growing crop in the succeeding drier months. This moisture is lost gradually by evaporation, the rapidity depending upon the state of cultivation and the temperature, and if the crop is to derive full benefit from it, sowing must be done before the heat of summer sets in. Subsoil moisture is of great importance to all crops, and, provided the supply is sufficient, fairly good results can be obtained even in the driest summer.

The following tables give the results of the experiments :—

A SERIES—With farm-yard manure.
Ten plots, each one-twentieth of an acre.

Plot. No.	Kind of Manure.	Quantity.		Yield.							* Increase per Acre.		
		Per Plot.	Per Acre.	Per Plot.			Per Acre.						
				cwt.	qr	lb.	ton	cwt.	qr.	lb.	cwt.	qr	lb.
1	Unmanured	. . .	. . . . .	1	2	37	1	14	3	8	....		
2	Farm-yard manure .. . . Superphosphate	10 cwt. 11 lb.	10 tons 2 cwt.	2	1	8	2	6	1	20	15	1	2
3	Farm-yard manure... . Sulphate of potash... .	10 cwt. 5½ lb.	10 tons 1 cwt.	2	0	13	2	2	1	8	11	0	18
4	Farm-yard manure... ... Sulphate of ammonia ..	10 cwt. 4 lb.	10 tons ¾ cwt.	1	3	4	1	15	2	24	4	2	10
5	Farm-yard manure .. .. Superphosphate ... .. Sulphate of potash	10 cwt. 11 lb. 5½ ,,	10 tons 2 cwt. 1 ,,	2	0	12	2	2	0	16	10	3	10
6	Farm-yard manure .. .. Superphosphate ... ... Sulphate of ammonia ...	10 cwt. 11 lb. 4 ,,	10 tons 2 cwt. ¾ ,,	1	3	12	1	17	0	16	5	3	26
7	Farm-yard manure... .. Sulphate of potash... ... Sulphate of ammonia ...	10 cwt. 5½ lb. 4 ,,	10 tons 1 cwt. ¾ ,,	1	3	3	1	15	2	4	4	1	14
8	Farm-yard manure... .. Superphosphate ... .. Sulphate of potash... ... Sulphate of ammonia ..	10 cwt. 11 lb. 5½ ,, 4 ,,	10 tons 2 cwt. 1 ,, ¾ ,,	2	0	10	2	1	3	4	10	2	14
9	Farm-yard manure... .	10 cwt.	10 tons	1	3	18	1	18	0	24	7	0	6
10	Unmanured	.. ...	......	1	1	14	1	7	2	0	....		

* Obtained over the average of the unmanured plots = 1 ton 11 cwt. 0 qrs. 18 lb.

B Series—Without farm-yard manure.

Ten plots, each one-twentieth of an acre.

No. of Plot.	Kind of manuring.	Quantity. Per Plot.	Quantity. Per Acre.	Yield. Per Plot.	Yield. Per Acre.	* Increase per Acre	* Decrease per Acre.
		lb.	cwt.	cwt. qr. lb.	tns. cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.
1	Unmanured	...	...	1 2 25	1 14 1 24	......	......
2	Superphosphate ..	22	4	2 0 7	2 1 1 0	8 2 8	......
3	Sulphate of potash ..	11	2	1 3 11	1 16 3 24	4 1 4	......
4	Sulphate of ammonia..	5½	1	1 2 8	1 11 1 20	.....	1 1 0
5	Superphosphate ... Sulphate of potash ..	22 11	4 2	2 0 3	2 0 2 4	7 3 12	...
6	Superphosphate ... Sulphate of ammonia..	22 5½	4 1	1 3 21	1 18 3 0	6 0 8	.
7	Sulphate of potash ... Sulphate of ammonia..	11 5½	2 1	1 2 16	1 12 3 12	0 0 20	
8	Superphosphate . Sulphate of potash ... Sulphate of ammonia..	22 11 5½	4 2 1	1 3 23	1 19 0 12	6 1 20	. .
9	Superphosphate ... Muriate of potash ... Sulphate of ammonia..	22 11 5½	4 2 1	1 2 26	1 14 2 16	1 3 24	...
10	Unmanured	...	..	1 2 5	1 10 3 16	.....	

* Taken from the average of the unmanured plots = 1 ton 12 cwt. 2 qrs. 20 lb.

From an examination of the tables it will be seen that comparatively good yields were consistently obtained by the use of farm-yard manure. In the plot where it was used alone the result was 10½ cwt. per acre greater than that obtained from the adjacent unmanured plot. If a comparison of section A is made with section B, it will be noticed that better results were uniformly obtained from the portion which received farm-yard manure, and that these results must, to a certain extent at least, be due to the application of that manure, indirectly, if not directly. That these increases should be caused by the physical effects of the manure, rather than by the plant-food it contains, is a reasonable assumption when the nature of the season is considered, and

the character of its action upon the soil understood. It has the effect of rendering the soil open, porous, and easily permeable to the plant roots—a condition very necessary to the full development of the potato crop. In a season such as the past, it also proved of considerable value by increasing the absorptive and retentive power of the soil for moisture. It is probably owing to this latter function that much of the good results obtained was due. The first necessity of all crops is a plentiful supply of moisture to build up the plant tissue, and to dissolve and carry into the plant the essential food constituents. Almost all soils contain more or less of these constituents, and in a dry year the development of the crop is largely determined by the amount of moisture present in the soil. That, even in dry years, some benefit is derived from artificial fertilisers, is shown by the results obtained; but the difference in the fertilised and unfertilised plots is not so marked as it would be if the season were more favourable to plant growth. The advantage of an application of farm-yard manure in connection with artificial fertilisers is shown by section A, where comparatively large yields were obtained, probably because of the increased moisture in the soil bringing into solution the chemical fertilisers applied. Farm-yard manure undoubtedly does assist the plant directly by giving up to it a certain amount of food material, but that the increased yields are not due to this solely is shown by section B, which received large quantities of readily soluble artificial fertilisers, but returned smaller yields.

Among the artificial fertilisers the best results were obtained by the application of superphosphate. The increases were consistently good, and in some plots the benefit derived from its use was very appreciable. The highest yield was obtained when it was applied in addition to farm-yard manure, a result which confirms the previous statement that farm-yard manure increased the action of chemical fertilisers by the conservation of moisture. In some cases the superphosphate did not give as large yields when given in conjunction with other chemical fertilisers as when used alone; but this was perhaps due to inequalities in the soil. In all experimental work on a large scale this difficulty is encountered, even adjacent rows sometimes showing a marked difference in yield. For this reason it is only by taking the results collectively that definite conclusions can be drawn. Superphosphate seemed to have the effect of materially hastening the ripening of the crop, a difference of several days being noticed between plots treated with it and those which received other fertilisers. This may have had something to do with the increased yields obtained, as, owing to the dry weather which prevailed, it was the early-maturing crops which gave the best yields.

Potash gave increased yields, but here again results obtained from its application with other fertilisers were in some instances smaller than when used alone. This was probably caused by the same differences in the soil.

The application of sulphate of ammonia did not appear to have any appreciable influence on the crop. The slight increases obtained in section A cannot be taken as definite evidence of its value, particularly as they were not borne out by section B. The difference was probably caused by the use

of farm-yard manure, and the nature of the treatment the soil had received would naturally lead us to expect such a result. A crop of peas had been grown on the land, and the vines and roots ploughed under. After this the land was practically lying fallow until the potatoes were sown. A leguminous crop, such as peas, has the power, under certain conditions, of utilising the nitrogen of the air by means of bacteria living in nodules upon its roots, and when the plants are ploughed in, nitrification of this organic nitrogen occurs, and it becomes available for subsequent crops. In addition to this, other nitrifying organisms are at work in the soil rendering the inert nitrogen available for the plant's use as nitrates. As practically no leaching occurred, large supplies were in readiness for the use of the crop. This affords a sound proof of the value of a comprehensive system of rotation, especially when it includes a leguminous crop. Nitrogen is the most expensive of artificial fertilisers, but fortunately for the farmer it can be obtained from the air by the growth of certain crops. These, when ploughed under, add to the soil nitrogen which has been obtained from the air at no other expense than that incurred for seed and labour. In addition to the nitrogen supplied, a large amount of organic matter is added, and has an important influence on the soil's fertility. When land is cropped for a number of years, unless organic matter is added in some form, its humus becomes exhausted, and a marked change takes place in its character. It loses its fine friable nature, and has not the same power of absorbing and retaining moisture. In other words, it has lost what is generally known as condition. This loss of retentive capacity is largely the cause of the noticeably poorer yields obtained from some soils after several years' working.

No figures are given of the profit or loss due to the use of the manures. Although in most cases increased yields were obtained by the applications, it was quite apparent, during the growth of the crop, that, owing to the absence of sufficient moisture, the whole of the fertiliser was not utilised. The rainfall for the season was much below the average, and the value of manuring can only be ascertained when normal conditions prevail. The residue left by the crop would remain in the soil, to be used by subsequent crops, and the increased returns obtained from these must be taken into consideration in determining whether a profit is derived from the application.

Summary.

1. The full benefit was not derived from the application of fertilisers; there was insufficient moisture in the soil to dissolve them for the use of the plant.
2. The application of farm-yard manure had a beneficial effect upon the yield. This was apparently due more to its power of conserving moisture, and to its mechanical effect upon the soil, than to the amount of plant food it yielded to the plant.
3. The plant food in farm-yard manure was not in a readily soluble form.

4. The heaviest yields were obtained by the use of farm-yard manure supplemented with soluble mineral fertilisers. These were dissolved by the moisture retained by the bulky manure, and became readily available for the plants' needs.
5. Among the artificial fertilisers superphosphate gave the best results. The yields obtained from its application with other fertilisers were not so good as when used alone. These apparently contradictory results were probably due to inequalities in the soil. Superphosphate seems to have the power of hastening the maturing of the crop several days.
6. The application of sulphate of potash increased the yield, but it was not quite so effective as the phosphate.
7. The application of nitrogenous fertilisers did not seem to be necessary when a proper system of rotation was adopted.

From the above results it would seem that the most profitable form of manuring was a mixture of superphosphate and sulphate of potash, with perhaps a small quantity of a nitrogenous fertiliser, applied in connection with farm-yard manure. Where the farm-yard manure is not available in sufficient quantities, green crops should be grown and fed off by stock or ploughed under to increase the humus in the soil. Leguminous crops should preferably be used for this purpose.

Every means should be adopted to retain in the soil a full amount of moisture, as upon this depends the effect of the fertilisers applied. Deep and thorough ploughing should be carried out to increase the depth of the soil, and to provide a reservoir in which moisture may be stored up in moist weather for the use of the crop when drier conditions set in. After the crop is sown continual cultivation should be practised to check evaporation and to prevent the growth of weeds.

Milling Products of Wheat.

Mr. F. B. Guthrie, in reply to a correspondent, furnishes the following information:—The proportion of flour, bran, and pollard obtained on milling varies with different mills and also with the state of the market for the different products. Roughly speaking, the millers produce on an average from 1 ton of wheat—

Flour	1,568 lb.
Bran	336 lb.
Pollard	336 lb.
	2,240 lb.

Some Notes on Phylloxera-Resistant Stocks at the State Viticultural Station, Howlong.

M. BLUNNÒ.

THE Department of Agriculture being the first to introduce phylloxera-resistant vines, and knowing how much their success depended on the concurrence of several factors for each of the various sorts, and there being no previous local experience available, it was decided to make the Viticultural Station an experimental as well as a propagating ground.

Planting cuttings of Phylloxera-resistant Stocks in nursery for the distribution of rootlings twelve months hence.
State Viticultural Station, Howlong.

European knowledge on the subject is certainly of the greatest value, and to a great extent could be relied upon to guide us in most cases in this country; but it would have been rash and venturesome to wholly accept European experience and apply it here *in toto*.

The texture of the ground at Howlong Viticultural Station is fairly representative of three typical soils, viz., sandy, light clay, and clay.

Experiments to ascertain the adaptability of phylloxera-resistant stocks to the various soils were first begun. Also trials were commenced, and are still conducted, to ascertain the degree of mutual affinity between the stocks and the fruit-bearing varieties. This is done by noting the quality and quantity of grapes yielded by a number of fruit-bearing varieties grafted on certain kinds of stocks, and comparing the data thus obtained with those from the same varieties not grafted. The comparative degree of affinity of any fruit-bearing variety with the stocks is arrived at by grafting the same variety on the various resistant stocks and comparing the respective crops for quality and quantity.

From the records thus obtained, in some cases extending over a period of seven years, the following information has been derived. The experiments are still being conducted:—

Adaptability of Phylloxera-resistant Stocks.

The Riparia Grand Glabre stands long dry spells of weather somewhat better than the cognate variety, Riparia Gloire de Montpellier. Both do

Rootlings and cuttings of Phylloxera-resistant Stocks heeled in ready for distribution among vine-growers. State Viticultural Station, Howlong.

splendidly in sandy soil, as is their nature; but the former is planted in a light clay loam, in which, though not growing very luxuriantly, it grows vigorously enough for practical purposes as far as can be judged by three years' growth.

The hybrids, Riparia x Rupestris No. 3,306, No. 3,309, and 101-14, planted in fairly stiff clay loam, do well grafted with several varieties of wine and table grapes, although the mother stocks (stocks not grafted) frequently get scorched during the highest summer temperature in January and February, in patches where the soil is stiffer. The partial withering of the foliage,

however, does not cause any appreciable loss of vitality in the plants so affected, inasmuch as every spring the same vines are covered with thick healthy leaves.

The Rupestris du Lot, Rupestris Metallica, Rupestris Martin, Riparia x Cordifolia-Rupestris No. 106, Solonis x Riparia No. 16, Mourvèdre x Rupestris No. 1,202, Cabernet x Rupestris No. 33, Chasselas x Berlandieri No. 41, Rupestris Cinerea de Grasset, Rupestris x Aestivalis, Berlandieri x Riparia No. 157^{11}, Aramon x Riparia No. 143, Aramon x Rupestris Ganzin No. 1, all do well in fairly heavy, but not too heavy, loam.

If the loam is impregnated with a good deal of clay the Riparia x Cordifolia-Rupestris No. 106, Mourvèdre x Rupestris No. 1,202, and Cabernet x Rupestris No. 33, are the best indicated.

The Solonis x Riparia No. 16 will stand well in fairly heavy low-lying soils; the various Rupestris above mentioned, viz., R. du Lot, R. Metallica, and R. Martin, will adapt themselves well to a fairly heavy pebbly soil. The experience with the Rupestris Mission in fairly heavy clay ground is that it is of very slow growth, and the stem of the stock takes a long time to grow thick enough to graft. This sort, however, thrives well in light soils, as I have seen it growing well in private vineyards.

The following varieties of wine grapes are grafted on the phylloxera-resistant stocks mentioned above:—

Aléatico, Cabernet, Lambrusquat, Malbec, Mammolo, Muscat de Frontignac, Verdot, Verdelho, Pedro Ximenes, Pinot Blanc, Shepherd's Riesling, White Shiraz, Aucarot, Syrah.

The principal varieties of table grapes are—

Alicante,	Lady Down's Seedling,
Almeria,	Large Chili Rose,
Barbarossa,	Malaga,
Black Ferrar,	Malvasia,
Black Hamburgh,	Mrs. Prince's Black Muscat,
Black Muscat of Alexandria,	Pearson's Golden Queen,
Black Muscat Hamburgh,	Raisin des Dames,
Black Prince,	Red Portugal,
Black Tokay,	Red Prince,
Black Turk,	Rose of Peru,
Blue Imperial,	Royal Ascot,
Centennial,	Royal Muscadine,
Cornichon Blanc,	Sabalskanskoi,
Crystal,	Syrian,
Doradillo,	Temporano,
Duke of Buccleuch,	Trentham Black,
Emperor,	Wax Waltham Cross,
Flame Tokay,	White Nice,
Gros Colman,	White Prince,
Gros Guillaume,	White Sherry,
Gros Maroc,	Several varieties of Chasselas.
Jerusalem,	

For raisins—

Gordo Blanco, Thompson's Seedless, Sultana.

All the above varieties have generally succeeded well on phylloxera-resistant stocks on which they have been grafted, the affinity between the stock and scion varying from medium to good, and in any case quite sufficient for practical and commercial purposes.

The Sultana only has shown a decided lack of affinity with the stocks, and most of the grafts have failed, while the Thompson's Seedless, which is almost identical to the Sultana, planted alongside, has in every case shown a decided liking for the phylloxera-resistant stocks. Several varieties of Chasselas have been grafted on Rupestris Martin and Rupestris Metallica, but have not done too well. It appears that in Europe, also, the Chasselas has not much liking for the phylloxera-resistant stocks, and does not graft well.

Generally speaking, it has been noted for the past four years that larger crops are obtained from the grafted vines than from those not grafted. In both cases the principal constituents of the grape juice, viz., grape sugar and acids, do not show any appreciable difference. Seven years' experience with phylloxera-resistant vines have shown that they are more liable to White-rot of the roots (*Pourridié*) than the ordinary vines. The Rupestris Metallica especially seems to have a marked sensitiveness to this disease.

The plots in which Rupestris Metallica are planted is a fairly heavy soil with a slight depression, which at no time has been water-logged, and cannot even be said to be damp, yet they succumbed, while about thirty different varieties of European vines planted in the same block are thriving well, and as yet show no sign of failure.

It would be as well, therefore, when reconstructing a vineyard on phylloxera-resistant stocks to have the ground well grubbed, and all dead timber and roots that might offer a breeding medium for the fungi of White-rot extracted and burnt. The soil should then be well trenched and drained. A site with a good natural drainage should be selected for a vineyard if possible.

Some of the hybrid stocks obtained in Europe, by crossing European varieties with American phylloxera-resistant vines and by selection, have proved so satisfactory in the Old World that it was decided to try them here. In Europe they have shown a great degree of adaptability to various soils, and a great affinity to the graft. The following hybrids were accordingly planted in phylloxera-infested ground in various places in the county of Cumberland to determine whether, with the above-mentioned faculties, they coupled a phylloxera-resistant power high enough to serve a practical purpose.

The experiment was and is a necessary one in Australia, for in Europe the results are varied.

The following hybrids have been planted:—Mourvèdre x Rupestris No. 1,202, Cabernet x Rupestris No. 33, Aramon x Riparia No. 143, Aramon x Rupestris Ganzin No. 1, Chasselas x Berlandieri No. 41. Although these vines are planted in what are the hotbeds of phylloxera, the above five hybrids after two years have shown no sign whatever of approaching failure. However it is too soon yet to come to any conclusion as to their practical resistance to the disease under local conditions.

The Settler's Guide.

Pisé.

[Continued from page 418.]

GEORGE L. SUTTON,
Cowra Experimental Farm.

The wooden rammers are made from hardwood, cut to the shape and dimensions shown in Fig. 1. These rammers are used for consolidating the bulk of the material after the corners and faces have been rammed with the iron rammer, which is a piece of iron or steel about 10 inches long, with a shank 11 inches long, forged to the shape of a right-angled triangle, and bolted to a wooden handle. The workman on the right in Fig. 12 is using the iron rammer.

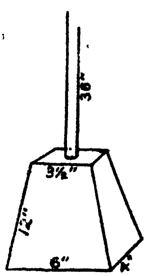


Fig. 1.—Wooden rammer.

The boxes can be made of any wood which will not twist or warp easily. It is an advantage to have it light and tough; because of this, cedar is the most suitable timber, but its scarcity and high price renders its use prohibitive. The boxes used at the Cowra Farm were made of Redwood, and gave great satisfaction. The size of the boxes will be governed, to some extent, by the amount of work to be done; for, obviously, no one will be willing to spend a large amount for material to make boxes for the erection of a small building. For a small building, boxes 2 feet deep will be suitable; but for a larger building, or for several buildings, it will be found economical to have the boxes 3 feet deep. Whether the boxes are 2 feet or 3 feet deep the construction will be the same. The planks, 12 in. x 1 in. or 12 in. x 1½ in., which should be planed on one side (the inside of the box), are braced and held together by 4 in. x 1 in. ledges. These ledges are preferably spaced so that, in addition to holding the planks together, they stiffen them at the places where the bolts, which

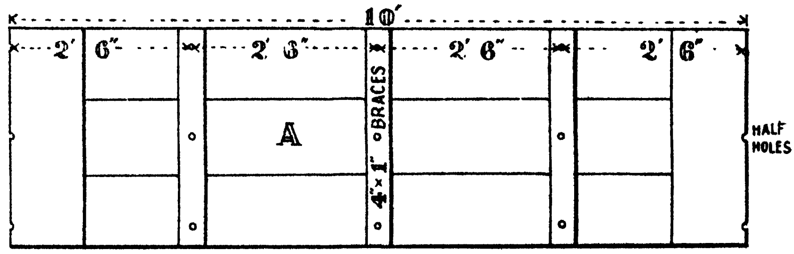


Fig. 2.—A straight box, without extension plates, as shown at *c* in Fig. 3.

hold the boxes together, go through them. Two of the straight boxes will require to be fitted with iron attachments, so that they can be secured together at right-angles to each other, and thus, together with the angle-boxes, form

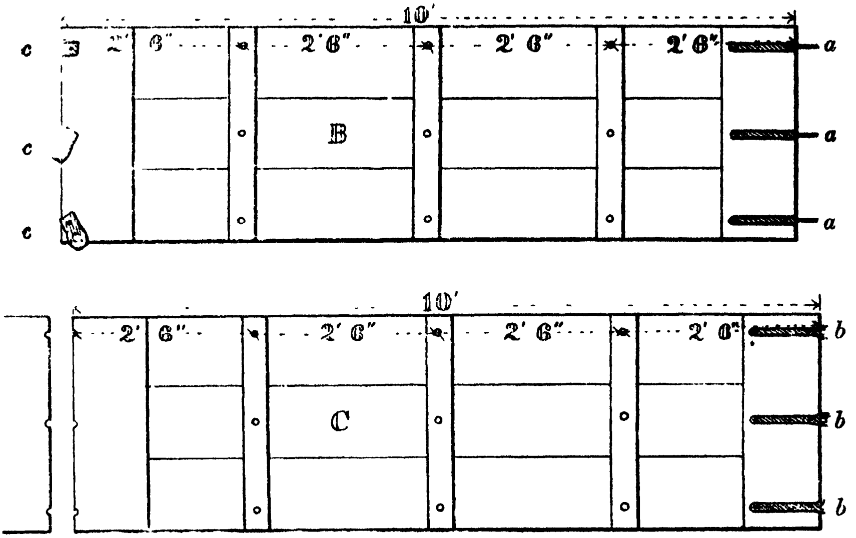


Fig. 3.—Straight boxes, fitted with attachments *a* and *b*, which enable these boxes to be used for making the moulds required for external angles. The plates *c* are useful when other straight boxes are connected with these to form a long extended box on straight walls.

a mould for making external corners. These attachments or plates are made of $\frac{3}{4}$ in. x $\frac{1}{2}$ in. flat iron, and are about 1 ft. 3 in. long. One of the pair (*a*,

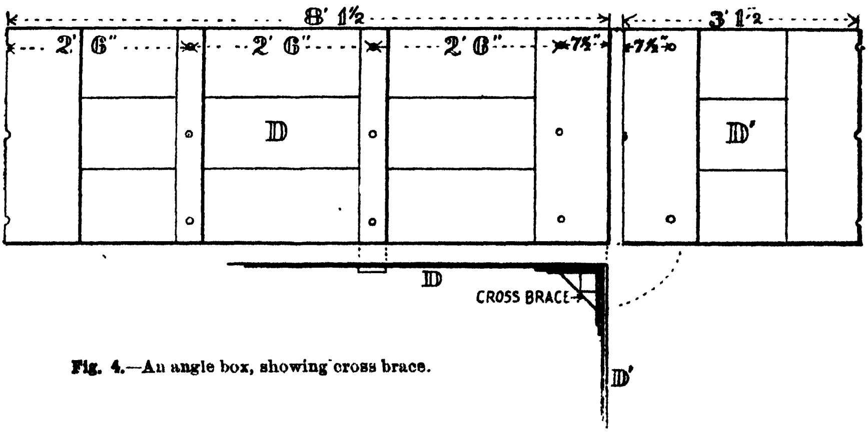


Fig. 4.—An angle box, showing cross brace.

Fig. 3) is shouldered to form at one end a $\frac{1}{2}$-inch round pin, which is threaded to take a nut. When the boxes are fitted up, this bolt end passes through a hole in the other attachment (*b*, Fig. 3), and is screwed up as tight as is

required. In Fig. 11 the workman on the right is shown screwing the boxes together.

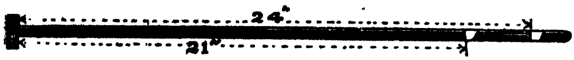
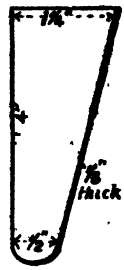


Fig. 5.—Bolt.



Figs. 5 and 6.—Bolt and key for holding the boxes together when forming moulds. Note that the key is tapering; the straight side should be next to the side of the box.

Fig. 6.—Key.

Where more than two straight boxes are available some of them should be fitted with 2 in. x ¼ in. flat iron plates, punched with ⅝-inch holes; these plates should be bolted loosely to the ends of the boxes (as *c* in Fig. 3) in such

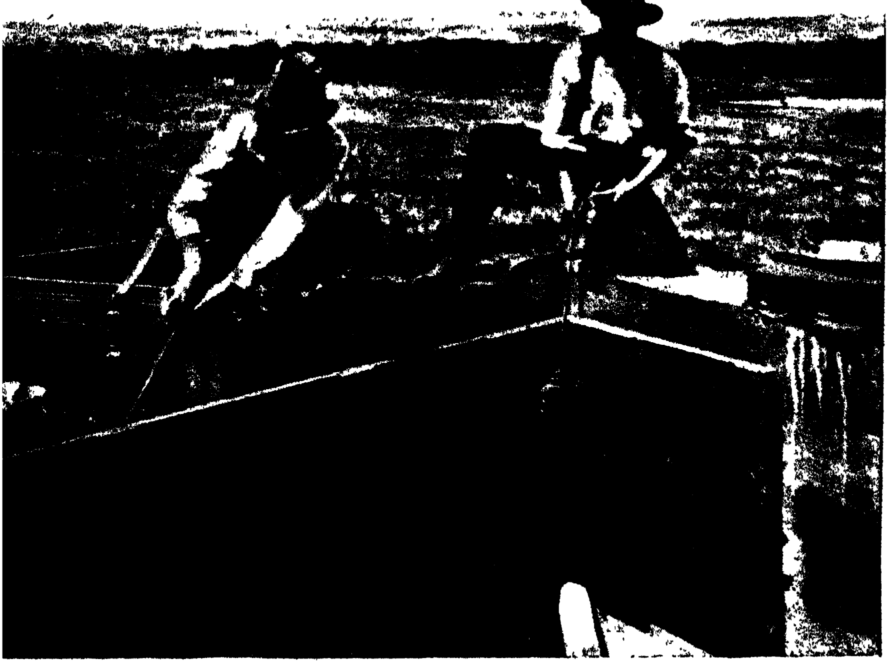


Fig. 7.—Fixing a box on the upper levels; the corner box is raised first.

a position that the holes in them will correspond with the ½-inch holes in the "box." These plates prove very useful when joining one "box" on to another.

A convenient length to have the straight "boxes" is 10 feet. The angle "boxes" consist of two sections, permanently secured at right-angles to each other by means of braced angle brackets, which are placed so as not to be in the way of the bolts which hold the "boxes" together. When the external walls are to be 18 inches and the internal ones 15 inches thick, a convenient size for the angle "boxes" is to have one arm 3 ft. 1½ in. and the other 8 ft. 1½ in. long, with the holes spaced as in the illustration. With this spacing the holes will coincide with the holes in the straight "boxes," when both are set up to build in a cross wall; and if additional "boxes" are available they can be continued on indefinitely without the necessity of boring fresh holes.

Fig. 8.—Showing the corner box propped up and being levelled.

If the thicknesses of the walls are other than those given, the length of the external angle "boxes" will be slightly different from that shown, and will be governed by the position of the first hole from the corner. For the holes in the angle "box" to correspond with the holes in the straight "box," when fitted up, the distance from the corner of the first hole in the angle "box" should be half the difference between the thickness of the internal walls and the distance at which the bolt holes are spaced—say, 2 ft. 6 in., which has been found about right.

The bolts, which together with the keys are used for keeping the "boxes" in position, are made of ⅝-inch round iron, with tapering keyways, as shown in the illustration (Fig. 5), the distances of the keyways from the head of the bolt being those suitable for 15-inch and 18-inch walls, when "boxes"

built of 1½-inch timber and 1-inch ledges are used. The keys are made of ⅜-inch flat iron, as shown in illustration (Fig. 6).

The sections for blocking up the ends of boxes are made of the same material and in a similar manner to the "boxes." Fig. 12 shows how these ends are constructed. Their length corresponds to the height of the boxes, and their width to the thickness of the wall being built, or to the space—at window or door frames—to be blocked in. They are kept in position by the bolts which hold the "boxes" together, and, when necessary, by packing between the ends and the bolts.

Fig. 9.—Showing how an outside corner box side is placed in position.

The gauge rods to regulate the thickness of the walls are made by cutting battens or round sticks into pieces as long as the walls are to be thick.

An abundant supply of washers is necessary in order to facilitate tightening the "boxes" to the width as regulated by the gauge rods. Wooden washers are very useful for placing next the side of the "box," and especially at joints. They are easily made by boring ⅝-inch holes in short lengths of battens.

The rammed earth—pisé—when dry is very hard, and in this state it is very durable. Moisture in any form softens it, and so changes its character that it becomes easily susceptible to injury. It is obvious, therefore, that pisé should be protected from moisture in any shape or form. The danger from rain is apparent, and is guarded against by surrounding pisé buildings with verandahs or overhanging eaves. Pisé buildings unprotected by verandahs are not uncommon, but the economy of protecting such buildings from the direct action of rain is now generally recognised.

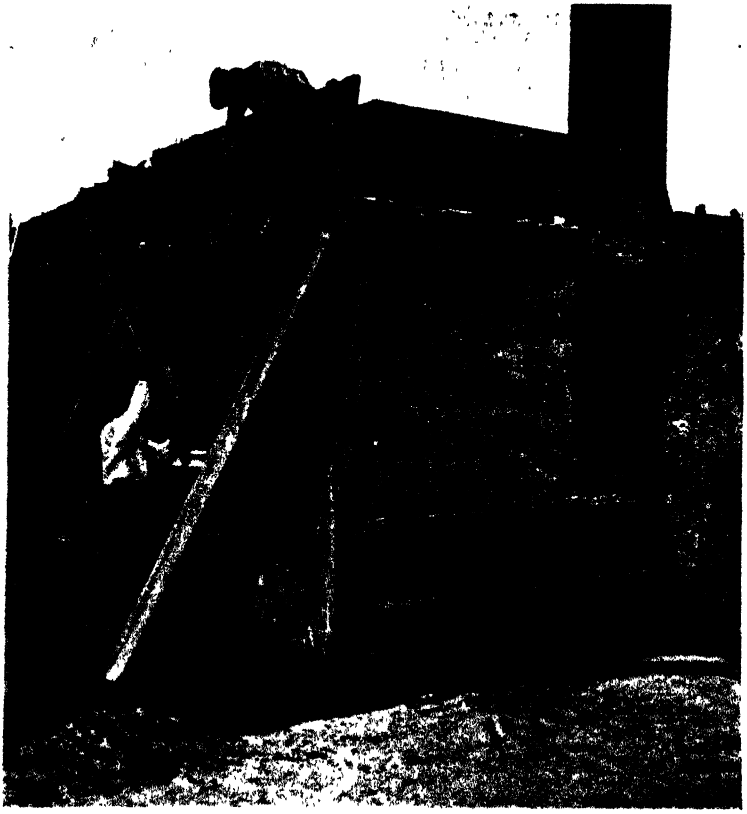


Fig. 10.—Shows the outside of box propped up and the bolts, which rest on the wall already built, being driven home.

The danger from the moisture contained in the soil on which the building rests is not so apparent, but it nevertheless is a real one. This moisture, by the force of capillary attraction, will rise up into the walls and affect their stability, as well as affect the health of the inmates. This danger is recognised in the building trade, and in brick buildings is guarded against by the insertion of a damp-course of non-porous material, like slates, Ruberoid, &c., at the floor level. In the case of bricks, which are unsoftened by moisture, this is a suitable place for the damp-course, but in the case of pisé it should be

inserted at the ground level and underneath the bottom of the pisé work. Provided the grass and other vegetation is removed, pisé work can be built right on the surface of the ground. Precaution should be taken to prevent the efficiency of the damp-course being destroyed by accumulations of soil against the wall. If this precaution be neglected, moisture will gradually rise up through the accumulated soil in the same way that water rises up through a sponge, and thus destroy the good effect of the damp-course. When,

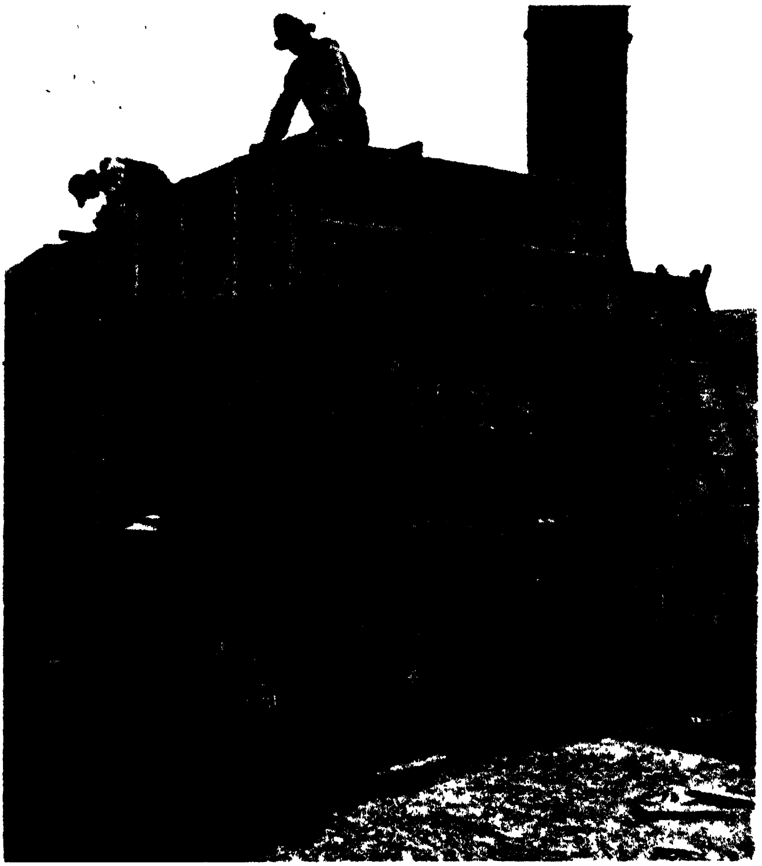


Fig. 11.—Shows the other straight side forming the outside corner placed in position, levelled and secured by cross bolts.

in order to obtain sound ground to build upon, excavations are necessary, the foundation should be of stone, concrete, or bricks, which should be carried above the ground level.

The expense entailed by the erection of a verandah may be regarded by some as a reason against the adoption of pisé as a building material; but who will say that, in a climate such as extends over a great portion of this State, a verandah is unnecessary to protect our buildings from the heat and glare of the midsummer sun.

As air does not readily penetrate through pisé walls, it is specially necessary that the provision made for ventilation should be ample. This is a matter often neglected, and in consequence such badly ventilated houses are unhealthy, and the rooms "stuffy" and "sweaty." There is no difficulty in ventilating pisé buildings properly, if the necessity for doing so be recognised. A convenient way is to make rectangular boxes of wood or concrete, the ends of which are covered with ventilating gratings. These boxes are made as long as the wall is wide, and are built in the wall as it is being erected.

Fig. 12.—Shows a partition wall bonded in. The workman on the right is using the iron right-angled rammer; the end to moulds is also shown on the left.

The timber used in the construction of pisé buildings, for frames, lintels, sills, &c., should be well seasoned; otherwise, on drying, it is likely to shrink away from the pisé and leave an unsightly crack. On account of the difficulty of obtaining seasoned timber, it is advisable to use no more than is absolutely necessary; and because of the simplicity with which concrete blocks can be made, it is recommended that concrete sills and lintels be used instead of wooden ones.

In fixing a box on the upper levels, first the corner box is raised (Fig. 7); it is then propped and levelled as is shown in Fig. 8; next, one of the straight boxes is raised by putting a bolt through one of the holes near the corner

(Fig. 9). Two of the straight boxes, on being bolted together, form a right-angle. After which it is propped up and held in position by the bolts (Fig. 10), which rest on the wall already built.

When the other straight box has been raised they are screwed together. After being levelled, the bolts are put in to prevent them spreading (Fig. 11), then the end is put in the mould, and it is complete (see Fig. 12) and ready for the earth to be shovelled in and rammed.

Fig. 13.—Shows another view of Fig. 12. Bonding-in a cross or partition wall.

A serious defect met with in some pisé buildings is that the internal walls are erected independently of the external walls, and after the latter have been completed. There is, in consequence, no bond between them, and what should be a source of strength to the whole building does not reinforce it in any way. The invariable result of such a procedure is that, as the internal walls dry, they shrink away from the external walls, showing a division which can never satisfactorily be filled up or hidden.

In Figs. 12 and 13 the bonding-in a cross or partition wall on the upper levels is shown.

(To be continued.)

Pera Bore Experimental Orchard.

W. J. ALLEN.

Citrus Fruits.

AT the Pera Bore Experimental Farm, which is situate about 514 miles north-west of Sydney, is to be found one of the Departmental orchards which at the present time is providing those interested in the matter with considerable food for reflection. The winter climate

Seedling Orange Tree, 10 years old.

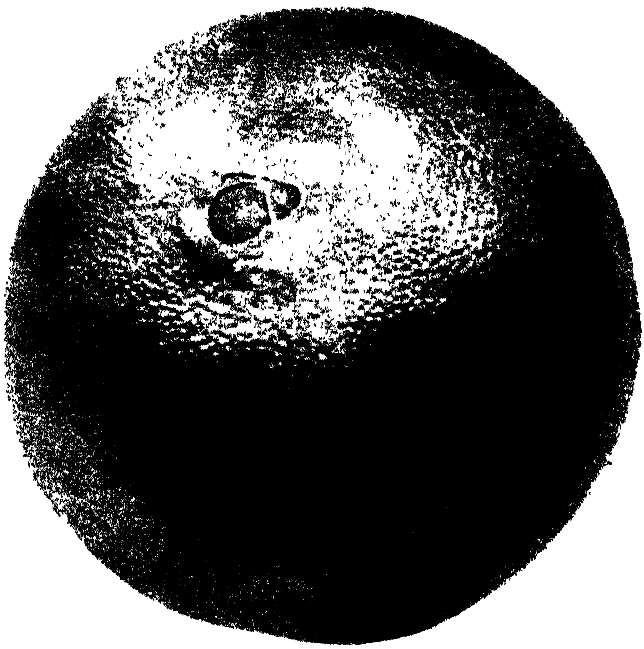
here is all that could be desired; but during the summer months the thermometer is inclined to play fast and loose, and it is no uncommon experience to find it running up to 110° Fah. and forgetting for a week on end to drop to more seasonable conditions, while occasionally it creeps up to 120° Fah., and even a degree or so over, so that the unwary visitor to the

Mediterranean Sweet Orange Tree, 9 years old.

Valencia Late Orange Tree, 4 years old.

place, unaccustomed to such climatic phenomena, may well be pardoned for wondering if he has struck one of the lower depths of the inferno. Be this as it may, and in spite of these occasional trying spells, there is no place in this country where a higher class of citrus fruits can be grown, nor is there any better climate for eight out of the twelve months than that of Bourke.

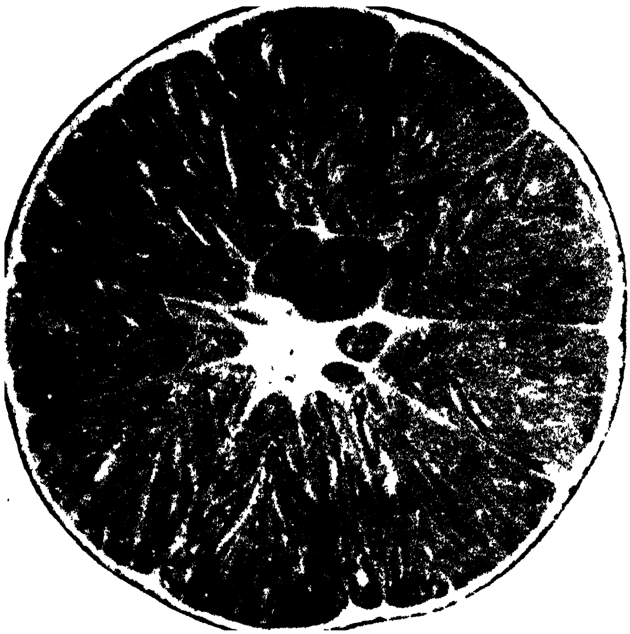
The farm is situate far enough north to benefit by the rains which frequently fall throughout the upper parts of the State and Queensland during the summer months, and it is during years when good seasonable



Washington Navel Orange.

rains fall that everything at this farm puts on its most luxuriant appearance. The soil is lacking in humus, and in consequence very hard to work, and unless stirred up immediately after either rain or an irrigation, it soon becomes as hard as flint. This state of affairs is not so noticeable wherever manure is worked into the soil, and therefore, during slack seasons of the year, manure is carted from any place where it is to be had. Peas are also being tried among the trees this year as a green manure-covering, and by working the ground deeply and thoroughly, and turning under green crops and applying all the manure we can get, we hope in time to put this land into better condition.

After each irrigation or heavy rain, the soil under the trees is broken up to a good depth with the fork-hoe, and all the land away from the trees well loosened up with the spring-tooth cultivator. When given such treatment the trees put on good growth, and, when old enough, carry fair crops of fruit. I have seen trees carry heavier crops for their size and age, but never saw any which produced fruit of better quality. Orders come from all parts of the State for this fruit, and the trouble heretofore has been to supply them. It was from this orchard that the oranges were sent last year which reached London in such excellent con-



Same Orange cut in halves.

dition, and were so highly commented on by the trade there. This year it is intended to again export some of the fruit from this orchard; but there will be no large consignment sent to London, as they are not prepared to pay anything like the price for high-class fruit that can be obtained in this country. The American market, however, will be tried, as good fruit usually commands high prices there; therefore, as this fruit is absolutely clean and free from disease, I do not think there will be any trouble in landing them, and it should realise the highest prices if we can place them there in good condition.

We have the following varieties growing, viz.:—Washington Navel, Thompson's Improved Navel, Valencia Late, Homosassa, Mediterranean Sweet, Siletta, Blood, Holdfast, Joppa, and one or two other varieties, as well as the Lisbon lemon. The trees do not grow to a great height, but make a more spreading growth than one is accustomed to see the orange-tree make in other parts of the State—the Mediterranean Sweets even more than the other kinds; and, strange to say, this variety is doing exceedingly well here, while it does not do at all well in a great many districts on the coast. The Washington Navel has proved itself a better cropper here than in most districts; and the Valencia does equally as well as in any part of the State. The Holdfast is improving as the trees grow older, and promises to do well. The Joppa also promises well, but the trees are too young as yet to give definite information about them.

Irrigating the Green Manure Crop (grey field peas) among 2-year old Valencia Late Orange Trees.

The Bloods are the least promising variety, and it is more than likely that these will be budded later to either Valencia Lates or Washington Navels, unless they improve as they grow older.

The railway freight from Bourke to Sydney is about 9d. per case in quantities by goods train, which is not by any means a prohibitive price for fruit of this quality. There is a good demand for oranges in the back country during the hot weather.

Owing to the hot, dry climate we have never been troubled with scales of any kind, so that while this orchard labours under the disadvantage of being a long way from Sydney, it has the advantage of being situate in a district where scales have never been troublesome on citrus-trees. The orchard is like an oasis in the desert, being about 9 miles distant from Bourke, in a part of the country where grass is seldom seen growing even

in the best of seasons. The surrounding country is timbered with gidgea, mulga, leopard, and other trees, and the fruit-trees do best where the large gidgea trees grow, on the lighter red soils.

It is quite a common sight to see camel trains, laden with all kinds of merchandise, on the way from Bourke back to the Never Never country, as well as bullock teams, with from 6 to 10 tons of wool on a waggon, *en route* to Bourke, where it is trucked and forwarded to Sydney by rail.

Bourke was at one time a large centre for all the stations in that part of the country, but since the Brewarrina line has been opened, and railway lines in Queensland extended further back into the interior, it has taken away a lot of trade, and in consequence Bourke has lost rather than gained in population during late years.

Export of Oranges.

W. J. ALLEN.

It is only one short year since we were complaining of light crops of citrus fruits, and now this year we have a record crop of exceptional quality, and a large proportion of which is free from disease and fit to send to any part of the world. A trial shipment of about three thousand cases has been exported to the London market, the Australian Fruit and Produce Company taking the lead in securing space and allowing growers to join them in sending some fruit if they felt so inclined, an offer which was availed of by a good many, who picked and despatched numbers varying from twenty-five to two hundred cases each. It was also gratifying to find that a few of the more enterprising passion-fruit growers took the opportunity of sending a few cases of this fruit, which was packed in several different ways, in order to ascertain by which method this most delicious fruit could be landed on the Old Country market in best condition.

While the growers are to be commended for again testing the carrying qualities of the New South Wales oranges, one had only to examine the cases of fruit to see how little some of the exporters know about the grading of their fruit, both for size and quality. The fruit, in place of being bright, clear, and sound, was in some instances spotted with old thorn-marked scratches and punctures and occasionally discoloured and disfigured with fumagine and fresh thorn marks. Fruit of two or three different grades could be found in many cases, and one shipper did not go to the trouble of wrapping his fruit.

It is regrettable that growers do not take more trouble in grading out all spotted and cull fruits, when testing the export market, as there is no demand in either Europe or America for anything but sound, clean fruit, and the sooner our citrus-growers realise this fact the better will be their chance of finding a profitable market for any fruit they send out of the State.

A word of praise is due to the officers of the Orient Steamship Company, who handled the fruit most carefully, and had it placed in their cool chambers in such a manner as did them credit. Had it been eggs in place of fruit it could not have been handled more carefully. This is the way all fruit should be handled in transit by either railway officials, carters, or on the wharf, but I regret to say it is the exception rather than the rule to see it done so. I feel sure that it will not be through any fault of the steamship company if the fruit fails to reach its destination in good order, and I trust that the enterprising few who have sent their fruits will meet with the success they deserve.

I would like to see some of our growers or exporters try the American market. On the 10th May oranges were selling in San Francisco at from 4s. to 14s. 6d., and lemons from 6s. 6d. to 21s. per case. I presume that at Vancouver, Seattle, Tacoma, and Portland the prices would be equally as high.

It must not be forgotten that only bright, sound, absolutely clean fruit will be allowed to enter the United States, and consequently it would be best to send small consignments first, until it is proved whether our fruit is sufficiently free from disease to be admitted. If we can succeed in landing it on the American market in good condition, I feel sure it will realise higher prices than in Europe, and the demand be much greater. August and September are two good months to send citrus fruits there if space can be secured on the Canadian line of steamers.

Maize at Bugaldi.

Mr. Neil Featherstone, of Bugaldi, writes:—"With reference to the five samples of maize sent to me for experimental purposes, I am pleased to say that they all turned out very well. Although the season, generally, was favourable, the maizes were sown a month too late, and a dry, hot spell happened to catch it just after cobbing. The Pride of the North succeeded best; but I think that the white varieties would yield better in a good season. I exhibited the maizes at the Coonabarabran Show, securing 1st prize for the Pride of the North in the small variety, and also 1st prize in the large. A special exhibit of the five samples was also shown, but there was no competition. This is my first crop here; but the land will grow almost anything, and I intend to work it on the best-known system that comes within my means."

Grasses at Bathurst Experimental Farm.

R. W. PEACOCK.

For many years a great number of grasses, both native and exotic, have been under observation at this farm. These notes will only deal with those most worthy of attention as adapting themselves to the conditions here.

Prairie Grass.

It should be understood that the climate is comparatively cold in winter and dry in summer. What are commonly called the English grasses grow very well during the best seasons; in the medium and bad seasons the summers are too severe.

Those which have given the best results are—Italian Rye, Perennial Rye, Cocksfoot, Prairie, and one comparatively new to the State, *Bromus pratensis*. All these make their principal growth during the spring and autumn, and make some headway during the winter.

As summer grasses, *Paspalum dilatatum*, African Wonder grass, *Panicum spectabile*, and *Panicum prolutum* have proved the best.

Paspalum dilatatum, although a somewhat coarse grass, apparently more adapted for cattle, has proved suitable for sheep; they relish it, and keep it eaten well into the crown. It is one of the most valuable summer grasses for sheep.

Italian Rye Grass.

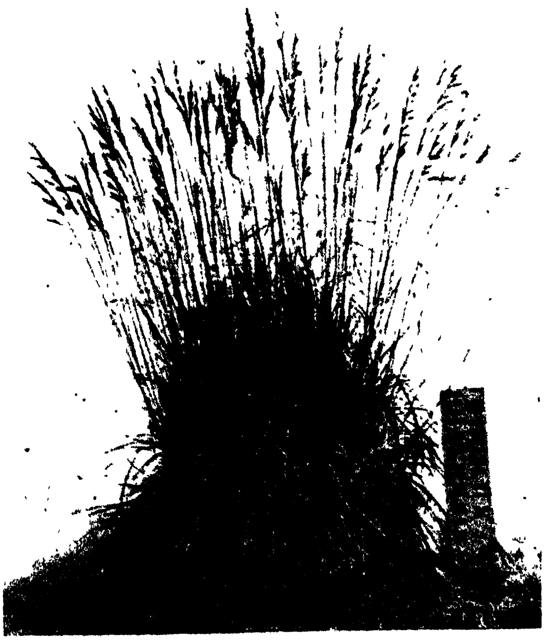
Perennial Rye Grass.

Panicum spectabile is a vigorous grower, and, although coarse, is relished by sheep. The frosts do not affect it seriously.

Bromus pratensis—A row of.

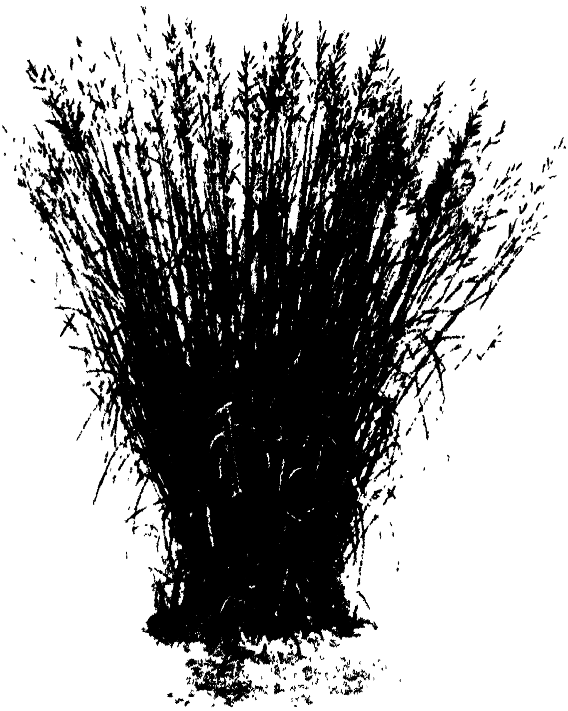
Panicum prolutum is a native grass, is hardy, and makes its best growth throughout the summer.

Milium multiflorum is a hardy grass, and thrives well under the conditions. As a fodder, it is woody and very harsh, excepting in its young stages, when it is acceptable to stock.

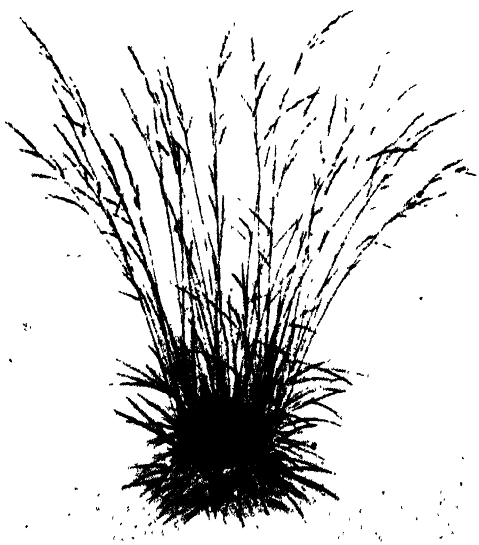


Bromus pratensis (single plant).

The other summer grasses worthy of mention are—*Diplachne fusca* (native), a *Diplachne* from America, and an *Eragrostis* from America.



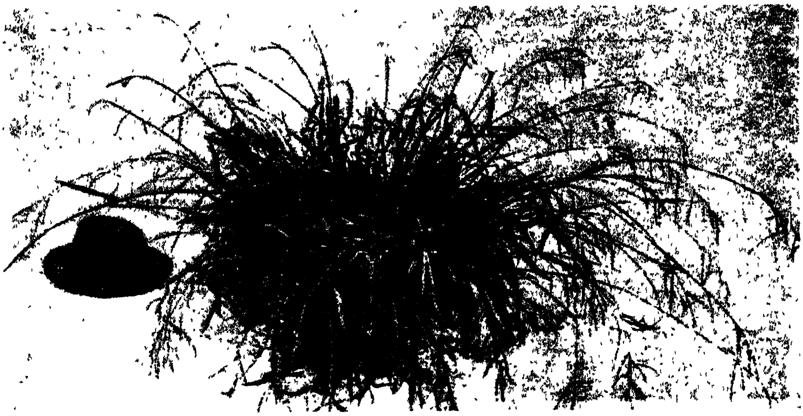
Bromus var., synonymous with Bromus pratensis.



Panicum spectabile.

Milium multiflorum.

Diplachne from America.



Paspalum dilatatum.

Panicum prolutum.

The main difficulty with summer grasses is that during the autumn and winter, when they are partially dormant, the Barley grass, *Hordeum murinum*, and Barren fescue, or Silky grass, *Festuca bromoides*, take possession of the soil. These pump out the moisture, and during the dry seasons the summer grasses are seriously checked.

Rhodes grass was unable to withstand the severe frosts of the Bathurst winters; it grew well throughout the summer months.

Phalaris commutata was under observation during the past twelve months. A reliable opinion should be formed after a more extended trial.

Rape and Superphosphate at the Bathurst Experimental Farm.

R. W. PEACOCK.

RAPE is grown at this farm as the staple winter fodder for sheep. The practice is to sow during the end of February on well-prepared wheat-soil. It has been proved that an application of 1 cwt. of superphosphate per acre gives practically double the return.

In 1906, the unmanured check-plot yielded 3 tons 10 cwt. per acre; the manured yielded 10 tons 1 cwt. 1 qr. per acre: excess over unmanured, 6 tons 11 cwt. 1 qr. per acre. The yields were estimated four months after sowing.

This season's crop (1907) was sown on 21st February. The difference between the manured and unmanured was more marked than during previous seasons; in fact, the unmanured plot yielded practically nothing—certainly not calculable fifteen weeks after sowing,—whereas the manured land yielded considerable food for the sheep. So marked was the result under the conditions, that it represented the difference between success and failure. The conditions were favourable for germination and growth during the first six weeks; the dry period of the latter part of April and the whole of May proved most unfavourable. The result was that the manured portion during the favourable early period made considerable growth; the unmanured portion grew unsatisfactorily. The vigorous start induced by the manure stood to the plant during the unfavourable period; the larger root system was able to command moisture from greater depths than the unmanured, the latter practically existing upon the drier surface soil.

The effect of superphosphate upon the early growth of rape, also wheat and other crops, is most marked, and the splendid results attending its application is in no small measure due to this fact. This should be borne in mind, and crops which have to be sown late, owing to unfavourable seeding periods, may be made to make up for such in some degree by the use of superphosphate.

The practice at this farm is to apply superphosphate to the rape, the succeeding wheat crop being planted without manure. The returns from the manure in this way are threefold: The application provides twice the fodder for the sheep, which is equivalent to carrying twice the sheep upon a given area; the liquid and solid excreta returned by the sheep are doubled; the aftergrowth, when the sheep are turned off during the spring, is also doubled, and when ploughed under, as it should be to get the best results from the system, provides double the organic matter so essential to fertility.

Farm Training for City Lads.

Dr. RICHARD ARTHUR, M.L.A.

There are many city boys who have a natural bent for a country life, just as there are lads born and bred in the bush who find their true avocation in the great centres of population. For many reasons, this interchange between the town and the country is a beneficial one for the community, especially when the movement is outwards from the town, and every

Bringing up the feed.

encouragement should be given to it. One of the most striking tendencies of modern times is the concentration of people in urban areas, with the resulting depopulation of the country districts. The many attractions of city life easily explain this tendency, but it is one, nevertheless, which is fraught with disastrous results to the community. The example of Great Britain is a flagrant one in this respect. There the agricultural population has diminished enormously during the last forty years, and along with this has gone a corresponding degeneration in the general physique of the British people This fact was clearly realised during the period of the South African war, when in some of the large centres of population no less than 80 per cent. of the recruits offering themselves had to be rejected for physical defects.

It cannot be doubted but that a similar process is at work in this State, and, therefore, any movement which should induce the city boy to turn his thoughts toward a country life should be welcomed by all who are interested in the welfare of the State. Even if the lad should not remain permanently in the country, a year or two passed in healthy toil in the open air will be of inestimable benefit in building him up physically, and in widening his outlook.

When, therefore, a lad, on leaving school, expresses his desire to follow a country life, every opportunity should be offered him of doing so.

But, unfortunately, many boys start with an altogether erroneous idea of what life on the land is. They imagine that it will be simply the

Cleaning up the Dairy.

daily routine they have been accustomed to, transferred into the country, only that instead of attending school they will be required to ride about on a high-spirited horse, shoot rabbits and kangaroos, and face various adventures by flood or fire, which they have read about in the magazines which cater for boyish tastes.

To such a lad, a few days spent on, say, a dairy-farm, brings speedy disillusionment. Rising in the dark on a winter's morning to bring in the cows, ploughing about all day, it may be, in rain and mud, bound continuously to work which, if not arduous, is at least somewhat monotonous, he soon realises that he has mistaken his vocation, and is as anxious to get back to the town as he was previously to leave. Occurrences such as these are disappointing both to his parents, who may have been

put to some expense in sending him into the country, and to the farmer who has given him employment on the understanding that he was anxious to work on the land, and was prepared to stay for a year or two while gaining farming experiences.

It was with the object of preventing such unfortunate occurrences that I proposed, some eighteen months ago, to the Honorable the Minister for Agriculture that provision should be made at the Hawkesbury Agricultural College for the reception of a number of city lads who desired to take to a country life, but whose parents were not in a position financially to allow them to be entered as students at the College. My idea was that the lads should be given board and lodging and instruction in the practical work of the farm for a few months in return for their services. I did not for a moment think that a three-months' course would be sufficient to teach them all they required to learn.

Field work.

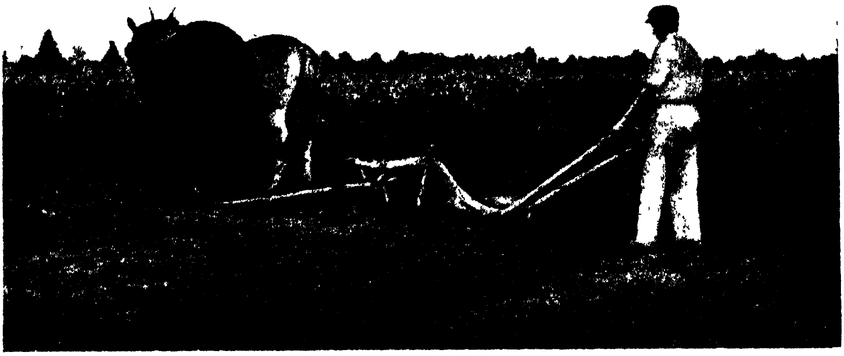
There were two objects sought for—

1. This course would act as a test by which it would be discovered if the lad had any aptitude and genuine liking for a country life. If, after a few weeks, he was found to be lazy, or physically unfit, he could be returned to his home without any harm having been done to anyone.

   On the other hand, if he gave satisfaction, a certificate could be granted to him at the end of his term to the effect that he was willing to work, and had at least mastered some of the rudiments of farming.

2. A course of three months would, for a lad of average intelligence, be sufficiently long to enable him to be of some use to the farmer to whom he was sent, and would justify him in asking a fair wage for his services.

He would know enough, for instance, about milking to prevent him from spoiling the cows of the private owner who was employing him. The cows that would have been deteriorated in value in the process of his acquiring skill in milking would be

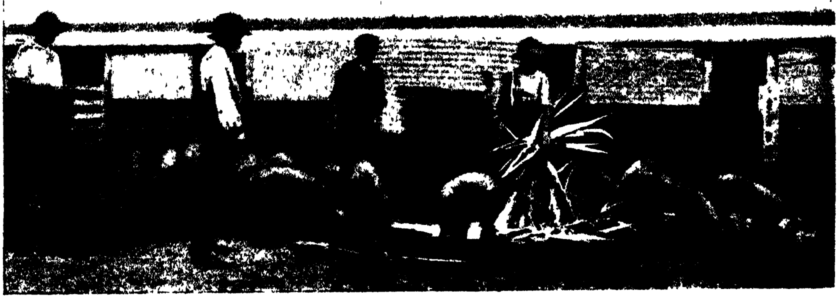


Learning to plough.

Government cows, and any monetary loss to the community in this respect would be more than compensated for by an addition to the number of the trained country workers.

On the other hand, it would be unfair to ask any farmer to allow his dairy herd to be used for a purpose such as this.

But, to return to the question of a location for this training farm, it was reported that accommodation could not be given at the Hawkesbury



Feeding the pigs.

College, but the suggestion was made that room might be found for the purpose at the Labour Farm at Pitt Town. The Honorable the Minister for Works, whose Department controls the Pitt Town Farm, gave every encouragement to the project, and as Mr. Schey, the Commissioner for Labour, took the matter up enthusiastically, it was soon an accomplished

fact. About seventy lads have already been through and are going through the course. They remain there for three months, and during that time learn to milk, to separate cream, to attend to a dairy, and to feed cows and pigs. They also have a certain amount of field work, are shown how to ride, drive a cart, harness a horse, and plough.

The accompanying illustrations will, however, give a better idea of the nature of the work they are engaged in than any words can do.

They are housed in a hut under the supervision of an instructor, who allots to each boy his task for the day. A time-table of work is arranged, so that every one will have his due share of the work on the farm. The lads have their meals and do their work quite apart from the men on the farm. The food they get is plain—even rough—but there is plenty of it, and it is a noteworthy fact that practically all the lads improve greatly in physique during their stay at the Farm.

The hours of work are not unduly long, and none are set tasks beyond their strength. The Manager of the Farm, Mr. Greer, takes a kindly

Among the poddies.

interest in his pupils, and tries to stimulate them to an intelligent appreciation of their work.

At the end of their term, a report on their conduct and capacity for work is furnished to the Commissioner for Labour, and it can be said that more than 90 per cent. of the reports are highly satisfactory.

There is a keen demand for the services of these lads among farmers from all over the country, and boys of 15 years have no difficulty in getting a place on a farm at from 7s. 6d. to 10s. a week and their keep, with a prospect of an early rise in their wages.

This work is one which ought to be further developed. At present the accommodation at Pitt Town is somewhat primitive, and the work is hampered through want of stock and proper implements.

But if improvements in this respect were made, and the opportunity for obtaining an excellent preliminary training in farming without any cost to the parents were made widely known, it is certain that hundreds of city lads would gladly embrace the chance of making a start for themselves in the country.

Fairy Rings and their Eradication.

C. H. ROBINSON,
Assistant Vegetable Pathologist, Victoria.

OF all the causes which operate against the formation and maintenance of a good, even turf in bowling-greens, golf-links, and lawns in general, perhaps none is more potent, in Melbourne and its suburbs at least, than the fairy ring puff ball, *Lycoperdon polymorphum*, Vitt. For ten years or more the fungus has been defying the efforts of the caretakers of our Melbourne bowling-greens to eradicate it, and until recently nothing short of digging out the affected areas was regarded as satisfactory. Such a method, though practicable where the rings are few and small, is out of the question when large and numerous, owing to the difficulty of securing a level surface after the work, and in a green so treated the remedy would probably be worse than the disease. Within the last two years, however, a cheap and effective method of eradication has been found, so that now the fairy ring ceases to occupy the position of a dangerous enemy, and may be regarded as a parasite easily destroyed.

For the benefit of those unfamiliar with the fairy ring fungus it may be mentioned that the name has been given on account of its curious effect upon the grass where it is found. The spawn of the fungus draws its nourishment from the roots of the grass, and spreads always in an outward direction to all points of the compass, so that shortly after a green has been infected and during the latter part of summer one sees a number of darker coloured, narrow circular bands or rings, less than a foot wide, but with a diameter of a few or several feet. In these rings the grass at first is so much deeper in colour than the rest that they are easily seen from a considerable distance, and it used to be said that this richer green was due to the dancing of fairies; hence the name fairy rings. Soon, however, a change for the worse is observed; the grass in the ring becomes thin, though still retaining its deeper hue; much of it dies away, resulting in an uneven surface, and a great number of small puff-balls are formed. If the turf is cut and rolled every day these puff-balls often escape notice, since in such cases they scarcely exceed the size of a pea; but, growing unchecked, they may reach a diameter of an inch or more, and may be nearly 2 inches high.

About ten years ago the lawn of the Flemington Racecourse and the Prahran Bowling Green were badly affected, and Mr. McAlpine, Vegetable Pathologist of Victoria, was consulted. Some experiments were conducted by him with various fungicides on the Prahran green from which it appeared as if a solution of sulphate of iron might overcome the disease, but unfortunately the

club authorities did not persevere with the treatment, and their green remained infested till 1905, when the whole was completely remade. About five years ago the rings made their appearance in the Armadale Bowling Green, and soon became so numerous as to sadly interfere with the play. Matters gradually grew worse till in April, 1905, the committee of the Armadale Club approached the writer, one of their members, and requested him to make an effort to eradicate the pest. This was willingly agreed to, and some preliminary trials were made on a small scale. Plots were treated with a solution of iron sulphate, Bordeaux mixture, copper-soda, and copper sulphate solution. It was soon found that mixtures like Bordeaux and copper soda, with their bulky gelatinous precipitates, were useless for the work, for the material could not be made to permeate the soil so as to reach the spawn of the fungus. Of the others, a copper sulphate solution of 1 oz. per gallon, using half a gallon per square yard on three occasions a week apart, was found to injure the grass before eradication was complete. Fortunately, the plot treated with sulphate of iron was doing well, no puff-balls appearing after three applications of a solution of rather less than 1 lb. in 5 gallons of water at intervals of a week, though, of course, it was then impossible to say whether the fungus had been entirely destroyed. The only sure test of eradication is in the absence of fairy rings and puff-balls in the next season.

The measure of success achieved with the sulphate of iron appeared sufficient to justify its use over the whole green, the rings being then so numerous that it is doubtful if an area of 30 square yards was free of them, and none could say how many centres of infection existed which next season would develop into rings. Accordingly the green was divided into sections of 60 square yards, putting on that area 8 lb. of sulphate of iron dissolved in 30 gallons of water. The solution of the iron sulphate was made in barrels and applied with ordinary zinc watering cans, one man using two at a time, one in each hand. The evening previous to the application the green was well watered, and after the solution was applied a further light watering was given to assist to convey the solution down to the roots. The green was closed two days prior to the first application, and it was found that where much trampling had occurred when play took place the iron sulphate blackened the grass to some extent, but no lasting injury resulted. Little effect was observed from one application beyond a deepening of the colour of the grass and a marked reduction in the number of puff-balls. Three additional treatments were given, four in all, at intervals of a week, and only two puff-balls were gathered on the whole green after the second dose, though before the first it would have been no hard task to collect a barrowful. Since the third treatment, no puff-balls have been seen on the Armadale green, and two whole seasons have passed with no trace whatever of anything in the shape of a fairy ring. Owing to the large amount of sulphate of iron used, over a ton to the acre, it was deemed advisable to give a heavy dressing of lime to reduce any remaining in the ground to a harmless state. A week after the last application, quick-lime, freshly slaked to a fine powder, was evenly spread over the surface at the rate of 1 ton per acre.

The success of these operations was so pronounced that other greens similarly affected are being treated this autumn. There are a few precautions to be taken by those seeking to profit by this experience, chief amongst them being the necessity for keeping the ground moist, and on no account to omit the dressing of lime a week after the last treatment. The area to be treated is better left without rolling, and it is well to cut the grass only once a week during the work, say two days before each application. Though four doses were given at Armadale, it is possible that three would prove sufficient, but less than that might leave some spawn uninjured in the soil to form the centre of another outbreak. The autumn—when the fungus is actively growing—is the proper time for the work; in the height of summer, or in the depth of winter, the prospects of success are not so bright, while the risk of injury to the grass is greater.

Inquiries are often made as to the manner in which the fungus is introduced to any particular area. There seems no reason to doubt that the practice, at one time fairly general, of using stable, cow, or sheep manure is mainly responsible, though it is a known fact that the surface soil of certain localities, favoured as a top dressing, contains the fungus in quantity. As precautionary measures against its introduction, the use of chemical manures and uninfested top dressings are of the highest importance.

Seeing the success thus achieved in eradicating a root-destroying fungus, it is quite likely that similar measures may prove of value in checking root rot of trees and vines, provided the disease has not gone too far. In any attempt in this direction, it is important to bear in mind that while a solution of sulphate of iron may prove effective there is little probability of success if used in the solid form.

The Sugar-cane root rot of Hawaii, and possibly of New South Wales and Queensland, has recently been shown by Dr. Cobb to be due to a species of *Ithyphallus* familiarly known as a "Stinkhorn" fungus on account of its disagreeable odour. This fungus belongs to the same group, the Gastromycetes, as the fairy ring puff-ball, and it is highly probable that sulphate of iron applied in a manner to suit the special nature of the crop, would prove of value in fighting the disease. In such cases treatment of the soil some time prior to planting is indicated as most likely to produce satisfactory results, and granted a sufficiency of rain, the crystals might be used without previous solution.

Mr. Hawkesworth's Report on Cross-bred Wools, Glen Innes Experimental Farm.

AFTER a careful examination, I find these wools are very good representatives of their crosses in every way, mostly with a good healthy growth well maintained, and very suitable for the great demands for cross-bred wools.

Shropshire-Merino Hogget is one of those well grown wools, right on to the edges, the backs being especially good. There is a nice lengthy staple showing with a good growth and full of character, the merino being very prominent and as free as possible from noil, and is a real good production suitable for manufacturing in all respects.

	d.	
Value ...	11¼	per lb.
Pieces—lofty, bulky, and could be combed	8	,,
Belly pieces—rather short, a fair sample...	7½	,,
Locks—bulky, free from stained wool	3½	,,

Romney Marsh-Merino Hogget. This sample is what may be called very fine for the cross; at the same time there is not the least sign of delicacy, excepting a little on the back. It has a bold fairly free staple, well crimped right to the ends, and is a very desirable cross-bred, for which there is at present a great demand.

	d.	
Value ...	10¾	per lb.
Pieces—light and bulky	7	,,
Belly—light and rather wasty	6½	,,
Locks—really 2nd pieces ...	4½	,,

Lincoln-Merino Hogget is a real typical wool of this cross, showing a bold, compact, lengthy staple, with crimps indicating quality and softness of texture; growth is free, very sound, and almost lustrous, with a kind soft texture. The condition is a little liberal, which brings down the value per pound a little.

	d.	
Value, fleece ...	10½	per lb.
Pieces—rather heavy	6½	,,
Belly—rather thin	6	,,
Locks ...	3	,,

Suffolk-Merino Hogget.—This wool, so far as value per pound is concerned, comes out on top, mainly through the condition, which is 4 or 5 per cent. in its favour from a buyer's point. It is a very well-grown wool, with a good depth of staple with pronounced character, the merino showing out distinctly. The quality is good, with a sound healthy growth, the fibre being full of pliability, is very even, and has a bright silky texture. It is a good yielding wool in all respects.

	d.	
Value, fleece ..	11¾	per lb.
Pieces—lofty and bright ...	8½	,,
Bellies—excellent growth and nice quality	8	,,
Locks—mixed with black ..	2¾	,,

Seasonable Notes.

GEO. L. SUTTON,
Wheat Experimentalist.

PLOUGHING for summer crops and fallowing land for winter crops is still in order, and should be continued with unabated vigour.

Whenever the ground occupied by growing crops becomes crusty, they can be harrowed with advantage until their foliage covers and shades the ground sufficiently well to prevent evaporation.

Where the seed for next year's planting is not being grown separately from the main crop, a portion of the main crop should be selected to provide next season's seed. The thistles, saucy-jacks, and other weeds should be removed from the seed area, for it is poor policy to allow these weeds to mature their seed and to become mixed with the seed for the main crops of the farm. At this time of the year the weeding is easily done, and does not entail much labour, whilst it largely aids in keeping the farm clean and in increasing the average yield per acre.

During the present month the rape crops in most districts are likely to be at their best. Sheep or other stock should be turned on them this month, in time to have them eaten off by the middle of next month. Under ordinary conditions, if left uneaten, they will flower towards the end of September, and will then prove troublesome to deal with when preparing the ground for next season's crop.

Even where this and similar crops have been grown with the sole object of improving the soil, they should on the score of economy be fed off rather than ploughed in. The feeding value of a crop is always greater than its manurial value, and when *fed off*, not carted off, the land is almost as much benefited as if it had been ploughed in.

As spring, the time for sowing hardy summer crops in the wheat districts, is approaching, "Penicilaria," as a hardy drought resister, is being boomed by the man who wants to sell the seeds of Pearl millet at 2s. 6d. per oz. Farmers are cautioned against paying extravagant and exorbitant rates for this seed, when by sending to a reputable seed firm for Pearl millet they can obtain it—*i.e.*, *Penicillaria seed*—at from 1s. 3d. to 1s. 6d. per lb. Periodically some one introduces this plant as a wonderful new fodder plant, under various names, and makes extravagant claims for it. In America it has been called, among other things, "Penicilaria," "Pencilare," "Pennisetum," and "Maund's American Wonder Forage Plant."

Pearl millet, of which the names given are synonyms, and the botanical name of which *Penicillaria*, or *Pennisetum spicata*, has a certain value principally on account of its extreme earliness. It is a millet resembling in habit the non-saccharine sorghums.

From time to time reports have appeared in the Press reflecting adversely upon the quality of the flour produced from the wheat "Bobs,"

whilst departmentally it was known that the statements as to the inferior quality of flour produced from "Bobs" were without foundation; yet these reports had sufficient influence to deter some farmers from planting that variety. As the best means of counteracting this influence, the Department availed itself of an opportunity which presented itself of obtaining an outside independent opinion of a recognised authority as to its quality. Messrs. Chicken and Corp, millers, of Cowra, purchased some locally-grown "Bobs," and ground it separately. On this fact becoming known to the Department, a half ton of the flour was purchased and shipped to the Agent-General in London, for submission to Mr. Albert E. Humphries, President of the National Association of British and Irish Millers, for test and report. The report is now to hand, and is as follows:—

". . . I can unhesitatingly say that the "Bobs" flour is the strongest Australian I have ever handled. As the term "strong" means different things in the estimation of different workers, I might explain in detail that it makes the largest and best-piled loaf of any Australian I have come across; but it does not make such large loaves as the flour made from any of the standard Manitoba wheats. It has given a very high yield of bread; but in making this statement it must be borne in mind that the flour you sent me has evidently been milled a very long time, and has all the benefit age can give it, combined with a very natural moisture. The colour of the bread is exceedingly white—so white that I should say it had been bleached artificially. The flavour of the bread is distinctly pleasing, except that it had the peculiar taste which arises almost invariably in greater or lesser degree from artificial bleaching. In my own opinion, this extreme whiteness is not desirable, and the bread would have been better if the flour had not been bleached, for the long period which elapsed between its being milled and its arrival here would have given it all the bleaching that was required . . . "

Combined with the facts already known regarding the milling quality of this wheat, such a report of this "Bobs" flour, purchased in the open market, the result from grain grown in the ordinary course of farming, and quite independently of Departmental influence, coming from such a recognised, unbiassed, and high authority as Mr. Humphries, should refute for ever statements to the effect that the flour produced from "Bobs" wheat is of inferior quality.

The general tone of Mr. Humphries' report appears to be one of surprise at the "strength" and colour possessed of this Australian flour. So white was the flour that he maintains it has every indication of being bleached; but this flour was not artificially bleached, its whiteness being the result of efforts to produce strong wheats, combined with that excellence of colour for which Australian wheats are famous.

The report is most gratifying, for from it and from the results of farmers' trials last season, we now have it brought home to us in an unmistakable manner that the climate of New South Wales is capable of producing wheats possessing that quality of "strength" sought after by millers and bakers the world over. The result of this knowledge should be the raising of the quality of our wheat to a higher level, with a relatively increased value.

Weather Conditions during June, 1907.

A. NOBLE,
Officer-in-Charge, Meteorological Department.

THE month opened with a disturbance centrally situated about 200 miles to the west of Adelaide, which moved rapidly eastwards and resulted in a general rainfall. The rain began in the far West on the 1st, and covered all districts, except those in the extreme south-east corner. Some splendid falls, approaching or exceeding an inch, occurred over the dry western and southern regions. The following three or four days were fine generally over the State, but on the 6th pressure distribution over the south-eastern quadrant of Australia and Tasmania showed considerable intensification for the previous twenty-four hours, barometers in Tasmania having risen to as high as 30·77. This alteration in pressure resulted in unsettled conditions again setting in over coastal districts. On the 8th, barometers fell generally over the continent, while an annular or ring-shaped depression formed over South Australia. This disturbance resulted in another rain-storm, which again commenced in the far West, and resulted in light to moderate rainfall throughout the State, with the exception of the extreme north-east corner. Unsettled conditions continued more or less generally for the next four or five days, and on the 13th intensified, causing another moderate but general rainfall, which continued until the 17th, but after that date gradually contracted its area until it reached the coast, where it lingered for several days.

During the passage of the above-mentioned storms, the whole of the State benefited to the following extent:—

On the North Coast	Nil to 46 points.
Hunter and Manning	8 to 464 ,,
Metropolitan	189 to 484 ,,
South Coast	82 to 693 ,,
Northern Tableland	54 to 206 ,,
Central Tableland	127 to 301 ,,
Southern Tableland	121 to 371 ,,
North-western Slope	99 to 250 ,,
South-western Slope	85 to 257 ,,
Central-western Slope	54 to 184 ,,
North-western Plain	44 to 192 ,,
Central-western Plain	28 to 112 ,,
Riverina	43 to 163 ,,
Western Division	26 to 181 ,,

On the 24th, barometers showed a considerable increase in Tasmania, while a decrease in pressure took place over the north-eastern parts of our State, extending towards Norfolk Island. These two factors were followed by southerly gales, with high seas along our coast. By the next day conditions had intensified, due to a further decrease in pressure between the coast and Norfolk Island. On the 26th, the disturbance moved away eastwards, and conditions gradually improved over the State, which, during the remainder of the month, was under anti-cyclonic control, finer but cold weather resulting.

The following are some of the lowest temperatures recorded :—Kiandra, 8°; Nimitybelle, 16°; Narrandera, 18°; Rockley and Murrumburrah, 20° each; Wentworth, 21°; and Goulburn, Hay, Molong, Wagga, and Young, each 23°.

The following statement shows a brief comparison of the chief meteorological elements over India, together with Australia, as far as data are available for the month of June, 1907 :—

	Departure from normal.		General Conditions (referring to State as a whole).
	Pressure.	Temperature.	
	Inch.	Degrees.	
India	− ·01	+0·7	Monsoon slightly weak.
Sydney (N.S.W.) ...	+ ·08	−0·5	Wet.
Melbourne (Vic.) ...	+ ·01	−1·8	Rather dry, frosty.
Perth (W.A.) ...	·00	+0·7	Slight excess.

The distribution of rainfall over the State as a whole for the month just ended, has been better than during any of the preceding months of this year. At a majority of the stations, the total registrations have been in excess of the normal. The greatest excess occurred in the far West, in the vicinity of Wilcannia, Menindie, Euriowie, and Broken Hill, where totals ranged from 95 to 153 per cent. above the normal.

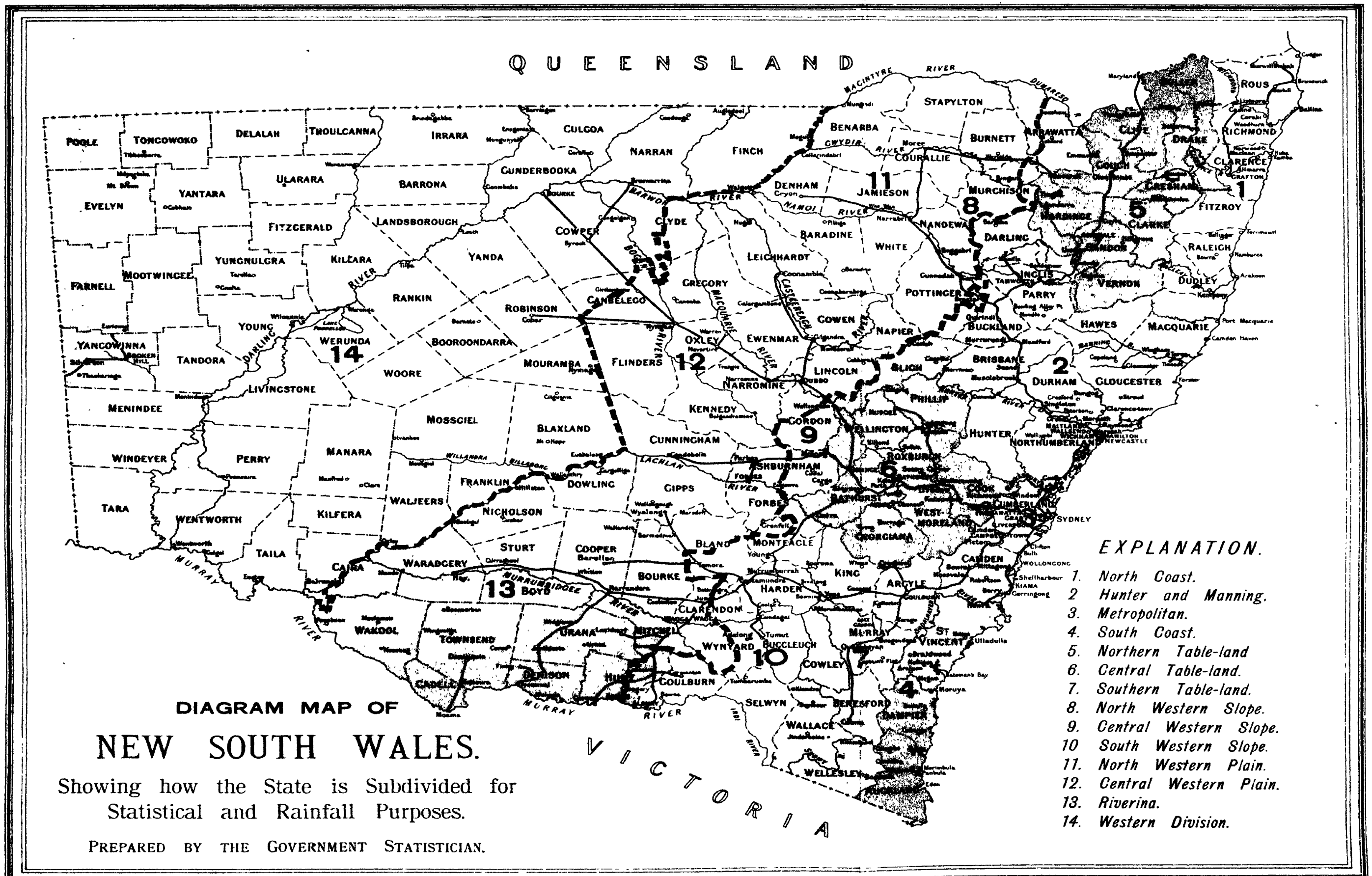
At some coastal stations the excess was also large, being greatest on extreme north and extreme south coastal parts, ranging, respectively, up to 120 and 127 per cent. above normal.

The less favoured regions extended over Riverina, parts of South-western Slopes, extreme south of Southern Tableland, and a tract from 50 to 100 miles wide extending to the north of the Lachlan River; also over Castlereagh, Macquarie, and Bogan Rivers. Over these areas, although substantial totals were recorded, they were generally below the normal, mostly from 25 to 50 per cent.

Taking the month as a whole, the distribution over the various subdivisions of the State was as follows :—

		Percentages. Above.		Below.
North Coast	from	120	to	30
Hunter and Manning .	,,	120	,,	32
Metropolitan	,,	9 to 69	..	—
South Coast...	,,	127	to	34
Northern Tableland ..	,,	49	,,	15
Central Tableland	,,	84	,,	47
Southern Tableland ..	,,	76	,,	51
North-western Slope ...	,,	81	,,	15
Central-western Slope ...	,,	15	,,	30
South-western Slope ..	,,	50	,,	57
North-western Plain ..	,,	60	,,	41
Central-western Plain ...	,,	19	,,	56
Riverina	,,	—	...	5 to 58
Western Division	,,	123	to	41

The map published with this report shows the subdivisions referred to. These are not readily found on ordinary maps of New South Wales; it is therefore suggested that the map be placed in a convenient place for reference.


QUEENSLAND
VICTORIA
DIAGRAM MAP OF
NEW SOUTH WALES.
Showing how the State is Subdivided for Statistical and Rainfall Purposes.
PREPARED BY THE GOVERNMENT STATISTICIAN.
EXPLANATION.
1. North Coast.
2 Hunter and Manning.
3. Metropolitan.
4. South Coast.
5. Northern Table-land
6. Central Table-land.
7. Southern Table-land.
8. North Western Slope.
9. Central Western Slope.
10 South Western Slope.
11. North Western Plain.
12. Central Western Plain.
13. Riverina.
14. Western Division.
SYDNEY
NEWCASTLE
MURRAY RIVER
DARLING
LACHLAN RIVER
MURRUMBIDGEE RIVER

Orchard Notes.

W. J. ALLEN.

AUGUST.

Green Manures.—Good, seasonable rains have fallen during the last two months, and the crops which were sown among the trees have at last made a start to grow. The prospects, however, are that the crops for turning under in the spring will be very light as compared with last year.

Commercial Manures.—These may be applied towards the latter end of the month or in September. In the drier districts, where late rains are uncertain, it is best to make the application early rather than late, as it is well known that they do not give the same results if applied when the soil is at all dry. If summer applications are made it is best to make them immediately after a rain, while the ground is quite moist, in order to obtain best results.

Citrus Fruits.—There is a good crop of both oranges and lemons this year, and most of the fruit is of exceptionally good quality. I trust that those who are exporting any will see that only bright, clean fruit is sent, and that the grading, wrapping, and packing receive the greatest attention, so that when the cases are opened they will present the most attractive appearance possible. It is better to destroy cull fruit rather than put it on the market and make a bad name for our fruits.

During the month of May oranges were selling in San Francisco at from 4s. to 14s. 6d. per case, according to sample; and the chances are that at Portland, Seattle, Tacoma, and Vancouver they are commanding as much or more. It would be well for our growers to test these markets with small consignments, for the following reasons:—First, to see how our fruit will carry; second, to see if there is any difficulty likely to arise as to their admittance; and third, to ascertain if they will sell at such prices as will compensate exporters for the trouble and risk of placing the fruit on those markets. I am confident that the prices will be all right, if only good fruit is sent.

Grafting.—The latter part of this month is a good time to start the grafting of deciduous nursery stock, and should there be any unprofitable apple, pear, or other trees standing in the orchard, these also may be grafted to good varieties. Grape vines are easily grafted just as the buds are well swollen and about to burst. Old peach, plum, and apricot trees will be found much harder to graft than either apple or pear trees. If, however, there are any such in the orchard which are unprofitable, it would be as

well to cut them back and graft to better varieties; and in the event of the grafts not taking, young shoots might be allowed to grow, and buds inserted either in the summer or fall.

Spraying.—Besides the above work, there is the winter spraying with the salt, sulphur, and lime solution, which will kill two birds with the one stone, being both an insecticide and fungicide. It answers fairly well in keeping in check the curl leaf of the peach-tree; for this latter disease Bordeaux mixture is even better. Trees treated with either of these solutions will show very little curl. The lime, sulphur, and salt is one of the best sprays we have for San José scale; but where trees are badly infested, it is best to give two sprayings, one in the fall and another in the spring, just as the leaf-buds begin to swell and before the trees are in bloom.

Peach Aphis.—For peach aphis the resin and soda is a good, useful spray, as is also the blue-oil emulsion; but it usually takes several applications to keep this pest in check. Another mode of treatment is to dissolve a cake of Sunlight soap in 2 gallons of water, and spray when warm. This is easy to mix, and has given satisfactory results in destroying this pest, and the wash will not injure the blossom, consequently the trees can be sprayed at any time. It is not safe to use other sprays when the trees are in bloom.

Woolly Aphis.—At time of pruning, particularly in young apple orchards, a sharp lookout should be kept for the appearance of woolly aphis, and should any trees be found infested, they should be carefully pruned, removing and burning as many of the infested twigs as possible. Then either scrub the trees thoroughly, using a strong kerosene emulsion, or fumigate with hydrocyanic acid gas, so as to eradicate this pest if possible.

Codling Moth.—All bark should be scraped from apple, pear, and quince trees, and the scrapings burnt, and everything in the orchard which would be a harbour for Codling moth destroyed. Keep all fruit-houses as clean as possible, as there is no doubt that they are responsible for harbouring a great many moths every year. Therefore, keep the rooms as airtight as possible, and as soon as the moths begin to hatch in the spring, burn sulphur fumes in the rooms once every other day for a fortnight, so that the moths may be destroyed as they begin to fly.

Vine Moth.—In working around vines, keep a sharp lookout for the pupæ of the vine moth. If there are any old, partially-rotted stakes, the moths will be found adhering to these, and also to the old bark which is hanging to the vine. Crush these whenever found, and thus assist in keeping down this pest as far as possible.

Fruit-canning and Preserving—Publications on.

For the information of those interested, I might mention that the Pomologist of the United States Department of Agriculture, at Washington,

has recommended as some of the best authorities on the fruit-canning industry the following, viz. :—

"Canning and Preserving," by Dr. Jean Pacrette, of Paris, price $5, and "Canning and Preserving, with Bacteriological Technique," by Professor Duckwall, price $5, are each to be had from the "Canner," 22, Randolph-street, Chicago, Ills., on receipt of price, plus postage, which is 29 cents per book in the United States, each work containing about 400 pages and about a fourth as many illustrations.

"The Canner's Guide" is a book published at $1, by F. G. Slemmer, Goldsborough, Maryland, and for information and catalogues on canning supplies these can be secured from the Sprague Canning Machinery Company, 42, River-street, Chicago, Ills.

TEFF GRASS (*Eragrostis abyssinica*).

THE Department of Agriculture has lately received seeds of the African Teff Grass (*Eragrostis abyssinica*), through the courtesy of the Bureau of Plant Industry, United States Department of Agriculture, Washington, D.C. Mr. A. F. Woods, Chief of the Bureau of Plant Industry, in a letter to the Director of Agriculture, says:—

"We have seed of two varieties of this, secured from Abyssinia, with which we have been experimenting in this country. In Abyssinia, as we understand, it is grown primarily as a grain crop for human food. The minute size of the seed is such, however, that there is scarcely any possibility of its being utilised in this way in the United States. We have been testing it as an annual hay plant, but we have serious doubts if it will be able to compete in this respect with the millets. I am taking pleasure in having a supply of seed of both varieties sent to you. This was secured from His Excellency S. A. Ras Makomen, Adis-Ababa, Abyssinia. . . . . . ."

Mr. Maiden, Government Botanist, says that so far as he is aware this grass has not been introduced into New South Wales previously, although it is hard to say, as so many *Eragrostis* seeds have been sent here from time to time. The Teff Grass resembles some of our native species of *Eragrostis* a good deal, and is worth experimenting with.

Seed of both the White and Brown variety has been sent to the Hawkesbury Agricultural College, and to Wagga, Bathurst, Berry, Coolabah, Cowra, Glen Innes, Grafton, Howlong, Moree, Pera Bore, and Wollongbar Experimental Farms, to be thoroughly tested.

Small trial packets of seed may be obtained, for experimenting, on application to the Director of Agriculture, Sydney.

Practical Vegetable and Flower Growing.

W. S. CAMPBELL.

DIRECTIONS FOR THE MONTH OF AUGUST.

Vegetables.

THERE seems to be every prospect of a late winter, judging from heavy frosts which are occurring at time of writing nearly all over the State; consequently any tender class of vegetables that are under weigh will need careful treatment. Tomatoes have been planted already by numbers of gardeners, but the plants need covering up at nights and for part of the mornings; but sometimes even this protection is useless against severe frosts. Of course, in the cold districts the planting out of such tender vegetables as tomatoes would be out of the question for some time to come. A few months ago a new tomato named Carter's Sunrise was referred to in these notes as being a satisfactory variety to grow, as it was proved by me to succeed well. This has been the case also in England, where this tomato originated. A writer in one of the Home papers says: "If I were asked to name one of the best tomatoes, I should unhesitatingly advise the variety Carter's Sunrise. I have seen this grown under many and varied conditions at all seasons of the year, including the big trial made by the Royal Horticultural Society at Wisley, and I have never once seen it but under the most gratifying conditions. It has everything to recommend it, being a very free setter even in the worst of weather, produces its trusses freely of beautiful shape and colour, medium size, and of the highest quality, absolutely distinct from any other variety I know."

During the month the following vegetables may be sown or planted:—

Asparagus.—Roots may be planted during this month in the warmer parts of the State. Seedlings of such a variety as late Argenteuil, if planted now in good soil, may, as has been the case, produce stems in sufficient quantity and large enough to permit of some of them being cut for use. It is an exceptionally good variety and quick grower.

Before planting asparagus, mix well with the surface soil a good dressing of farm-yard manure. When planting dig out a shallow trench, sufficiently deep and wide to permit of the roots being carefully spread out at the crowns of the plants to be covered with 2 or 3 inches of soil—not more. Old asparagus beds may be cleaned up, and be supplied with a dressing of farm-yard manure. A dressing of nitrate of soda in the spring should prove beneficial. If this artificial manure is not easily obtainable try sulphate of ammonia. Say a handful of either of these to the square yard.

Artichoke, Jerusalem.—Tubers of this good vegetable should be planted during the month, and the earlier the better. Make trenches about 6 inches deep and about 3 or 4 feet apart, and set the tubers in these trenches about 1 foot to 18 inches apart, and then cover up and keep down the weeds until the plants shade the ground, when it is unlikely that weeds will grow.

Beans, French or Kidney.—This section includes such varieties as the butter beans, wax beans, snake beans, and may also for general purposes include the useful scarlet runners, for the cultivation of all these is practically the same. All of these beans may be sown in the early and warm districts, where frosts are unlikely to occur again ; but in the late and cold places there is a great risk in sowing.

Beet, Red.—Sow a row or two from time to time during the month in order to keep a supply going. Make use of ground that had been manured well for cabbage or cauliflower or something of that kind, for the application of fresh manure for red beet is not a good practice. Sow the seed in drills about 18 inches apart and about an inch deep. If the soil is dry, water well, and then cover the seed with fine soil. When the seedlings come up, and have grown to be about 3 inches in height, thin out to 9 inches or 1 foot apart. Cultivate the ground well during the growth of the beets.

Beet, Silver.—This can either be sown in a seed-bed and the young beets afterwards planted out, or it can be sown in drills about 18 inches apart and the seedlings thinned out to about 18 inches apart The first method is, perhaps, the best, for but very few plants are required to be planted at a time, and these should last for some time.

Broccoli, Brussels Sprouts, Cabbage, Cauliflower, Savoy.—Seed may be sown in seed-beds in drills. Sow thinly. Prick out seedlings when 2 or 3 inches in height, and transplant from former prickings out to the permanent beds.

Celery.—Sow a little seed from time to time in order to keep up a sufficient supply of plants for putting out in trenches. When the seedlings have attained a height of 2 or 3 inches, prick out and afterwards transplant to heavily-manured shallow trenches. Very few plants at a time will be required. The blanching should not begin until the plants are almost full grown.

Celeriac or Turnip-rooted Celery.—This kind of celery differs from the well-known variety, inasmuch as the plants form a tuberous stem somewhat like a turnip, and this tuber is made use of either fresh or cooked. Sow a little seed and plant out seedlings of previous sowing if any have been raised. It does not need earthing up or blanching.

Cardoon.—If plants are available, plant at about 3 feet apart. Manure heavily and induce good speedy growth.

Carrot.—Seed may be sown to any extent required during the month, for this is a good time to sow. Make a very fine seed-bed and sow in drills very shallow.

Cucumber.—Sow a little seed in districts where late frosts are not likely to occur. Plants may be raised in seed-bed, boxes, or pots, and when the plants have made a leaf or two beyond the seed-leaves, they may be planted in well manured ground. Shallow basins made in the soil an inch or two deep will be found useful in which to plant, where watering is necessary.

Leek.—Sow a little seed, in seed-bed, box or pots, and when the seedlings have attained a height of about 6 inches or more, plant them out in heavily manured ground.

Lettuce.—Sow in seed-bed a little seed occasionally; prick out carefully seedlings and afterwards transfer to the bed where they are to grow.

Melons, Marrow, Squash, Pumpkin.—In warm districts, any or all of these may be sown in the garden. In cold-climate districts seeds may be sown under protection, but it is still early in such districts where heavy frosts may occur until October.

Onion.—Seed may be sown either in beds where the onions are to grow, or in seed-beds where seedlings can be raised for planting out when large enough to move. The latter is the best plan for farm gardens. Any seedlings already raised can be planted out during the month in rows 12 to 15 inches apart, and in the drills the young onions may be planted about 9 inches apart. Make the onion beds rich with good farm-yard manure.

Parsnip.—Seed may be sown largely during the month, in ground that has been deeply dug. No manure should be applied directly for this crop.

Peas.—Be sure to raise abundance of peas to meet all needs before hot summer weather sets in in the warm districts.

Potatoes.—Plant a few rows of Early Rose or Kidney varieties. Avoid cutting into sets, if possible. Plant in rows about 3 feet apart, setting the potatoes about 6 inches deep and 1 foot apart.

Radish.—Sow a little seed from time to time during the month.

Rhubarb.—Towards the end of the month this vegetable may be planted in well manured, well dug-up soil. Plant about 4 feet apart, and so deep that the crowns of the plants will be about 2 or 3 inches only below the ground when they have been covered with light soil.

Salsify or Vegetable Oyster.—Sow seed in light, rich, deep soil, and try this vegetable for a change. Make the drills for seed about 15 inches apart, and when seedlings come up thin out to about 4 to 6 inches apart.

Sweet Potato.—Obtain tubers, lay them together in a warm place, and nearly cover with farm-yard manure, in order to induce growth of vines for the making of cuttings. Keep moist, and as soon as there is a good growth of vines make them into cuttings, which will strike root readily in sand, after which the cuttings can be planted out.

Tomato, Egg Plant, Cape Gooseberry, and Capsicum.—Seeds may be sown in beds, boxes, or pots during the month in warm weather.

Flowers.

Towards the latter part of the month of August spring advances quickly in some of the districts of the State, and it would be well in such districts to make provision for the raising of half-hardy and even tender annuals. The hardy kinds should be flowering very well, and numbers of different kinds of bulbs such as the freesia, the early daffodils, tulips, and so on. The handsome anemones and ranunculuses are also likely to begin flowering, and what with all these, and violets and so on, there should be no want of beautiful flowers.

In the early portion of the month all those roses that need it should be pruned, for very soon the wood-buds will begin to break into leaf and growth will begin. Cut out all dead wood, and keep each, if possible, to one stem. If roses have been regularly pruned and some little care has been taken with them, they are likely to be in good shape and be provided with abundance of clean, healthy wood. Should any be overgrown with dense masses of weak inferior branches, it will, perhaps, be as well to give them a very severe pruning back, in order to induce good fresh growth. When pruning or thinning out is finished, burn all rubbish and give each rose plant a good dressing of farm-yard manure.

Evergreen shrubs and trees may now be planted, except in the very coldest districts. Carnations should not be overlooked, for they may be planted out freely, and also all other kinds of dianthus. Amongst this class of flowers are numbers of most desirable members which produce almost unlimited numbers of flowers. Any hardy annuals on hand had better be planted out as soon as possible.

COWPEAS AND MAIZE AT POKOLBIN.

MR. W. W. G. HALL, of Warwickana, Cessnock, writes:—"The cowpeas supplied grew well on my farm at Pokolbin. The nine varieties were planted in drills, with sufficient room between them to keep the land clean and loose. After germinating, the cultivator was used three times, and the drills hilled slightly. The soil was rather poor, consisting of a reddish clay loam. Several good rains during their growth gave a good growth in all, but the Chinese mottled grew slightly taller than the rest and produced more vine-growth. They all seeded freely, and this will be used to give larger trials."

"The Iowa Silvermine maize was planted in rather stony, poor soil, but gave a splendid yield of full even-grained cobs, with medium-sized cores. I am well satisfied that the Iowa Silvermine will do well here."

Farm Notes.

Hawkesbury District—August.

H. W. POTTS.

This month is a very busy one with the farmer. Ploughing operations, if not already finished, should be pushed on with rapidly. All forms of vegetable matter—maize-stalks, weeds, &c.—should be turned under so as to become thoroughly decomposed and incorporated with the soil and render available plant-food for the crops afterwards sown. Where early spring feed is scarce the maize-stalks shredded will prove a good standby to stock, and should be conserved for that purpose. Where possible the cultivation areas should be deeply ploughed and got into a fine condition of tilth. Conservation of soil moisture is an essential to successful crops, and as the subsoil this winter has not been plentifully supplied with moisture from rains, endeavours must be made with the view of promoting those conditions which favour the absorption and retention of this indispensable constituent. Sowing operations may commence this month if the weather conditions are favourable.

Potatoes.—Main sowings of this crop may be made. Growers should be careful in obtaining their seed to procure clean tubers, and free from disease. The red and brown-skinned varieties prove the most profitable to grow. Bliss's Triumph, Brownell Beauty, Satisfaction, Imperator, and Early Rose are among the best. The last named being an early sort should be planted towards the end of the month. On poor lands manure may be used. If well-rotted farm-yard manure is available from ten to twenty loads per acre may be applied. Where a complete fertiliser is required either to supplement the stable manure, or provide it solely, the following will be found suitable :—

4 cwt. superphosphate
1 ,, sulphate of ammonia
1½ ,, sulphate of potash.

Maize.—Main sowings may be made in well-prepared land in places where frosts are not troublesome. Red Hogan, Early Mastodon, Riley's Favourite, Golden King and Golden Drop are amongst the best varieties to grow. Early maturing sorts, such as King's Early, Pride of the North, or Ninety-day are best planted towards the end of the month.

Lucerne.—Where the autumn sowings of lucerne could not be made, the seed may be planted this month. Clean seed, free from dodder or any other impurities, may be sown at the rate of from 12 to 15 lb. to the acre.

Onions.—Spring sowings may be made in the field of this crop. Brown Spanish, Early Brown, Globe, Silver King, and James Keeping are good sorts. The land should be deeply worked and got free of weeds.

Crops for Green Feed.—Rape and turnips sown during the autumn will now be available for feeding off. Much labour and time will be saved if sheep or pigs are depastured on them. Hurdles may be utilised for keeping the animals in place, and feeding off small areas at a time.

Rye, Algerian Oats, and *Rape* may still be sown for green feed provided the weather is not too dry. On the rich flats of the low lands good results will be obtained by sowing the Algerian oat for hay this month. About 2 bushels per acre will be required.

Roots.—Field carrots, parsnips, mangolds and sugar beets may be planted for stock food. The land must be worked to at least 12 inches deep. The seed is best sown on ridges, in drills 20 to 30 inches apart, and later on the plants thinned out to 20 inches. On rich deep soils the Mammoth Long Red mangold will give best returns. The mangold is a gross feeder, and heavy dressings of farm-yard manure may be applied with advantage.

Sweet Potatoes.—Tubers of this valuable plant may be sown in specially protected beds in warm situations for raising suckers for planting. A forcing bed may be used to hasten the sprouting. A heap of fresh horse manure a couple of feet deep is stacked in a warm sheltered position. On top of this several inches of sharp sand should be placed. Pack the tubers closely together, but not touching, and cover lightly. As soon as the shoots are 6 or 7 inches long they are fit for transplanting into the field.

Towards the end of the month land may be got ready for planting sorghums and millets, and melons and pumpkins.

HAWKESBURY AGRICULTURAL COLLEGE.

MONTHLY WEATHER REPORT.

SUMMARY for June, 1907.

Air Pressure (Barometer).			Shade Temperature.				Air Moisture Saturation=100.			Evaporation (from Water Surface).			
Lowest.	Highest.	Mean.	Lowest.	Highest.	Mean.	Mean for 15 years.	Lowest.	Highest.	Mean.	Most in a Day.	Total for Month.	Monthly Mean for 9 years.	% of the year's Evaporation.
29·71 14	30·52 6th	30·18	32·0 30th.	69·5 2nd.	51·945	51·419	69	100	86	·132 25th.	1·636	1·833	3·7

Rainfall...																					
Points ..	2	1	28½	4	1	11½	56	1½	51	4	1	4	29	59	1	1	3½	8	1	28	4
Dates	1	2	3	7	8	10	11	12	13	14	15	16	17	19	20	21	22	23	24	25	26

Total 300,

Monthly Mean for 15 years.
222 points.

Wind ...	N	NE	E	SE	S	SW	W	NW
		4			12	2		

Thunderstorms. Frosts—4, 17, 27, 28, 29, 30.

Greatest daily range of temperature = 28·8, 4th.

Days on which shade temperature fell below 42° 3, 4, 5, 9, 17, 18, 21, 27, 28, 29, 30.

Remarks.—A dull month; showery, but with rains of little weight. Frosts occurred on six mornings of a light nature; nothing to do much damage.

CHAS. T. MUSSON,
W. MERVYN CARNE,
Observers.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Sub-Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1907.

Society.	Secretary.	Date.
Forbes P., A., and H. Association	N. A. Read	Aug. 7, 8
Narrandera P. and A. Association	W. T. Lynch	,, 7, 8
Royal Agricultural Society of New South Wales—Grand Horse Parade and Sales.	H. M. Somer	,, 7, 8, 9, 10
Gunnedah P., A., and H. Association	M. C. Tweedie	,, 13, 14, 15
National A. and I. Association of Queensland	C. A. Arvier	,, 13 to 17
Parkes P., A., and H. Association	G. W. Seaborne	,, 14, 15
Moana A. and P. Association	C. L. Blair	,, 21
Murrumbidgee P. and A. (Wagga Wagga)	A. F. D. White	,, 21, 22, 23
Northern Agricultural Association (Singleton)	C. Poppenhagen	,, 21, 22, 23
Corowa P., A., and H. Society	J. Fraser	,, 27, 28
Grenfell P., A., and H. Association	Geo. Cousins	,, 27, 28
Junee P. A. and I. Association	T. C. Humphrys	Sept. 4, 5
Cowra P., A., and H. Association	E. A. Field	,, 4, 5
Albury and Border P., A., and H. Society	W. J. Johnson	,, 10, 11, 12
Young P. and A. Association	G. S. Whiteman	,, 10, 11, 12
Cootamundra A., P., H., and I. Association	T. Williams	,, 17, 18
Germanton P. and A. Society	Jas. Stewart	,, 18, 19
Wyalong District P., A., H., and I. Association	S. G. Isaacs	Oct. 1, 2

1908.

Dapto, Unanderra, A. and H. Society	Geo. Lindsay	Jan. 8, 9
Albion Park A., H., and I. Society	H. G. Frazer	,, 15, 16
Berry Agricultural Association	A. J. Colley	,, 21, 22, 23
Wollongong A., H., and I. Association	J. Beatson	Feb. 6, 7, 8
Alstonville A. Society	Wm. W. Monaghan	,, 12, 13
Gunning P. A., and I. Society	W. T. Plant	,, 13, 14
Camden A., H., and I. Society	A. Thompson	,, 19, 20, 21
Kangaroo Valley A. and H. Association	E. G. Wilkinson	,, 20, 21
Campbelltown A., H., and I. Society	A. R. Payten	,, 26, 27
Bega A., P., and H. Society	W. A. Zuegel	Mar. 4, 5
Yass P. and A. Association	Will. Thomson	,, 4, 5
Tenterfield P., A., and Mining Society	F. W. Hoskin	,, 4, 5, 6
Crookwell A., P., and H. Society	C. T. Clifton	,, 19, 20
Gundagai P. and A. Society	A. Elworthy	,, 24, 25
Inverell P. and A. Association	J. McIlveen	,, 24, 25, 26
Hunter River A. and H. Association (West Maitland)	C. J. H. King	,, 24, 25, 26, 27
Walcha P. and A. Association	S. Hargraves	Apl. 2, 3
Upper Hunter P. and A. Association (Muswellbrook)	Pierce Healy	,, 8, 9, 10
Deniliquin P. and A. Society	L. Harrison	July 18, 19

[1 Plate and 1 Map.]

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Agricultural Gazette of New South Wales.

Forestry.

SOME PRACTICAL NOTES ON FORESTRY SUITABLE FOR NEW SOUTH WALES.

[Continued from page 662.]

J. H. MAIDEN,
Government Botanist and Director of the Botanic Gardens, Sydney.

XVII—*continued.*

Conifers.

V.

(5.) *C. Lawsoniana*, Murray. "Lawson's Cypress."

Figured in *Bot. Mag.* t. 5581.

The tallest of all Cypresses, attaining a height of 150–200 feet in its native country,—South Oregon and North California.

"It is polymorphous, giving rise to varieties so distinct from the normal form, and so varied in habit and outline, that several of them are justly ranked among the best of subjects for the geometrical or formal flower garden, both in summer and winter. It may be used for almost every purpose for which Conifers are planted as a single specimen for the lawn or park, in groups of its own kind, or intermixed with other trees or shrubs, for evergreen hedges, or as a funereal or cemetery tree."—(Veitch's Manual.)

It tolerates Sydney, but does far better in cold, moist localities. It is very sensitive to drought.

L 6 (Sydney Botanic Gardens).

(6.) *C. lusitanica*, Miller. "Cedar of Goa." (Syn. *C. glauca*, Lam.)

A medium-sized tree of 40–50 feet. A native of South Europe, perhaps of Portugal, and certainly not of Goa.

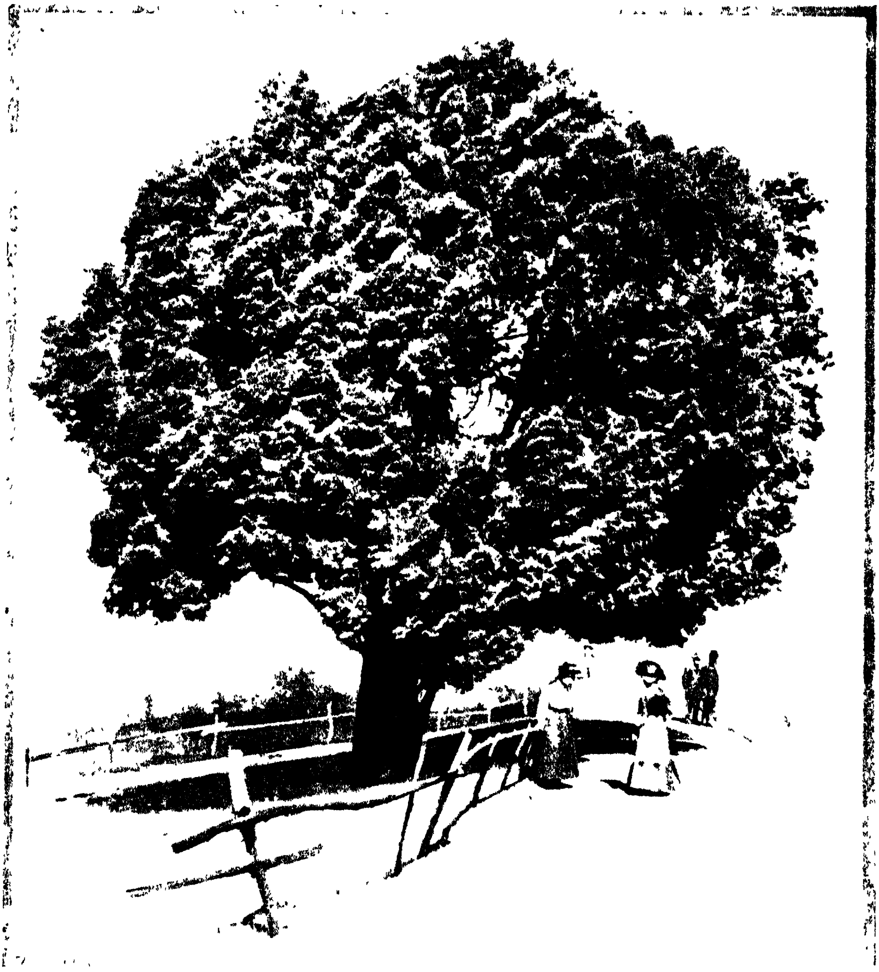
A handsome species, which does very well in the Sydney district.

L 6 (Sydney Botanic Gardens).

(7.) *C. Macnabiana*, Murray.

Sargent, 109, t. 528.

A medium-sized tree, with rather coarse foliage. A native of California at a considerable elevation, and quite hardy in Britain. It is said to be readily distinguishable from every other species, and seems worthy of attention. It used to be grown in the Sydney Botanic Gardens, and should be tried again. Our plants were quite small shrubs, very slow growing.



Cupressus Goveniana, Gordon (C. Californica, Carr.) old plant.

Botanic Gardens, Sydney

For description see page 662.

(8.) *C. macrocarpa*, Hartweg. "Monterey Cypress."

Figured by Sargent, t 525.

A tree attaining a height of 50 feet and more, and large-fruited, as its name denotes. It is a native of South California, near the sea. It grows freely in the young state, and is a handsome plant. In its native country it like the cedar of Lebanon in shape when old.

In the warmer parts of New South Wales, including Sydney, it is very liable to attack by borers, and hence is not to be recommended for a permanency. It was very extensively planted in the Sydney district at one

Cupressus lusitanica, Miller.
Botanic Gardens, Sydney.

Cupressus sempervirens L.
Palace Gardens.

time, but is now rare there. It does better in the Blue Mountains, but it is not a safe plant.

The variety known as *C. Lambertiana*, Carr., is a far better form in our experience—far safer, and far more durable. It is not attacked by the borer so much as typical *macrocarpa*, and is the form usually planted for *macrocarpa*, as being decidedly more generally useful in this State.

L 1 (Sydney Botanic Gardens).

(9) *C. nootkatensis*, Don. "Nootka Sound Cypress" (of Britain). "Yellow Cypress" (of America).

Figured by Sargent, t. 530.

A large tree, attaining a height of over 100 feet.

It is a native of Oregon and British Columbia. While somewhat variable in habit, it is by no means so variable as the closely-allied *C. Lawsoniana*.

With us, a small-growing species.

U 3 a; also its var. *variegata* (Sydney Botanic Gardens).

(10.) *C. obtusa*, Koch. "Japanese Cypress."

Figured in Veitch's Manual.

A tall tree in its native country, attaining as much as 100 feet. It is a variable species, and many of its varieties are under cultivation, being usually known in British gardens as *Retinospora*, and in Continental ones as *Chamaecyparis*.

It is a tree held sacred by the followers of the Shinto faith, whose temples are built exclusively of its timber, and it is largely cultivated around the temples. It is much esteemed for lacquer ware. It is one of the species dwarfed by the Japanese.

It is not entirely happy in the Sydney district.

L 11 a; var. *argentea*, L 11 a (Sydney Botanic Gardens).

(11.) *C. pisifera*, Koch. "The Pea-fruited Retinospora" or "Japanese Cypress."

A smaller and more slender tree than *C. obtusa*, with which it is everywhere associated in Japan. Like *obtusa*, it is somewhat variable.

It does fairly well in the Sydney district, being a much stronger plant than the preceding.

M 19, L 11 a; var. *squarrosa*, L 7 a (Sydney Botanic Gardens).

C. sempervirens, L. "Roman Cypress."

"A tree of variable height and habit, but usually recognisable in two distinct forms: the one with spreading branches and of broadly pyramidal or conical outline, but in old age with an open head and of irregular outline; the other with upright branches more or less appressed to the trunk and to each other, forming a flame-shaped or columnar tree of dense aspect."—(Veitch's Manual.)

Common throughout the Mediterranean region.

Cupressus torulosa, Don.
Botanic Gardens, Sydney.

This cypress is a very long-lived tree, and some specimens attain a great size. Its timber also is proverbially durable.

The fastigiate form is sometimes known as *C. fastigiata*.

L 7, 8, 17, 20 (Sydney Botanic Gardens), and the more horizontal form as *C. expansa*. L 5 (Sydney Botanic Gardens).

Both forms do well in Sydney in good soil.

(13.) *C. thurifera*, H.B.K.

A tree of 50 feet and more. Native of Mexico, and apparently suited to New South Wales, since it does fairly well in the Sydney Botanic Gardens.

L 9 (Sydney Botanic Gardens).

(14.) *C. thyoides*, L. "White Cedar" (of the United States and England).

Figured by Sargent, t. 529.

Native of the eastern United States, where it inhabits coastal swamps. A tall, slender tree of 70–80 feet. The leaves are used to make Cedar-leaf oil.

It does fairly well in the Sydney district.

L 8, 9, 11a (Sydney Botanic Gardens).

Var. *ericoides* is a dwarf form, about 5 feet high with us.

L. 33 D.

Var. *variegata*.

L 8 (Sydney Botanic Gardens). This has been a very handsome plant in its day, but it is getting old now.

(15.) *C. torulosa*, Don. "Bhotan Cypress."

A large tree, attaining a height of 70–80 feet Native of the Himalayas.

It does fairly well in the Sydney district.

L 6, 8, 33 c (Sydney Botanic Gardens).

A variegated form at L 6 (Sydney Botanic Gardens).

The variety *Corneyana*, whose native country is uncertain, has branches and branchlets pendulous. The umbos of the scales are less or not at all developed.

It also does well in the Sydney district. It is not so "stiff" looking as the type form.

L 29 c (Sydney Botanic Gardens).

(To be continued.)

The Settler's Guide.

Pisé.

[Continued from page 687.]

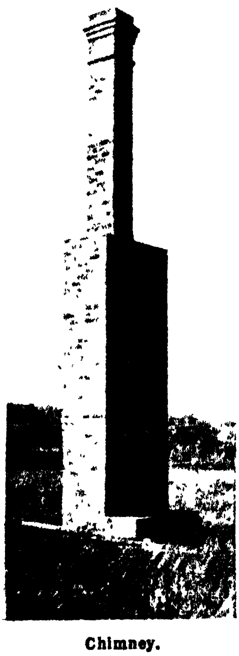
G. L. SUTTON,
Cowra Experimental Farm.

Pisé has its limitations ; it is quite unsuited for elaborate or complicated architecture ; but a careful man has in this material the means whereby he can build plain, substantial, durable, and comfortable buildings very cheaply Pisé may be finished to resemble concrete or stone work by plastering it ; but this operation should be delayed until the pisé work is thoroughly dry, otherwise the plaster is apt to scale off. The plaster used should be very " poor " or weak, as it is found a poor plaster adheres more firmly to the walls, which, before they are plastered, should be roughened with a rake or other similar tool.

Cement should not be applied to pisé : it is rarely, if ever, satisfactory, as it—even a thin wash—invariably peels off in thin flakes. The most satisfactory method of colouring pisé is to limewash it.

The following plans and specifications of the pisé cottage illustrated are furnished, as it is possible they will prove helpful to settlers who feel disposed to erect buildings of this material.

For generous aid rendered in drafting these specifications, I have to make grateful acknowledgment to Mr. J R McDonald, builder, Cowra.



Chimney.

Ploughman's Cottage, Cowra Experimental Farm.

SPECIFICATIONS.

Excavator.

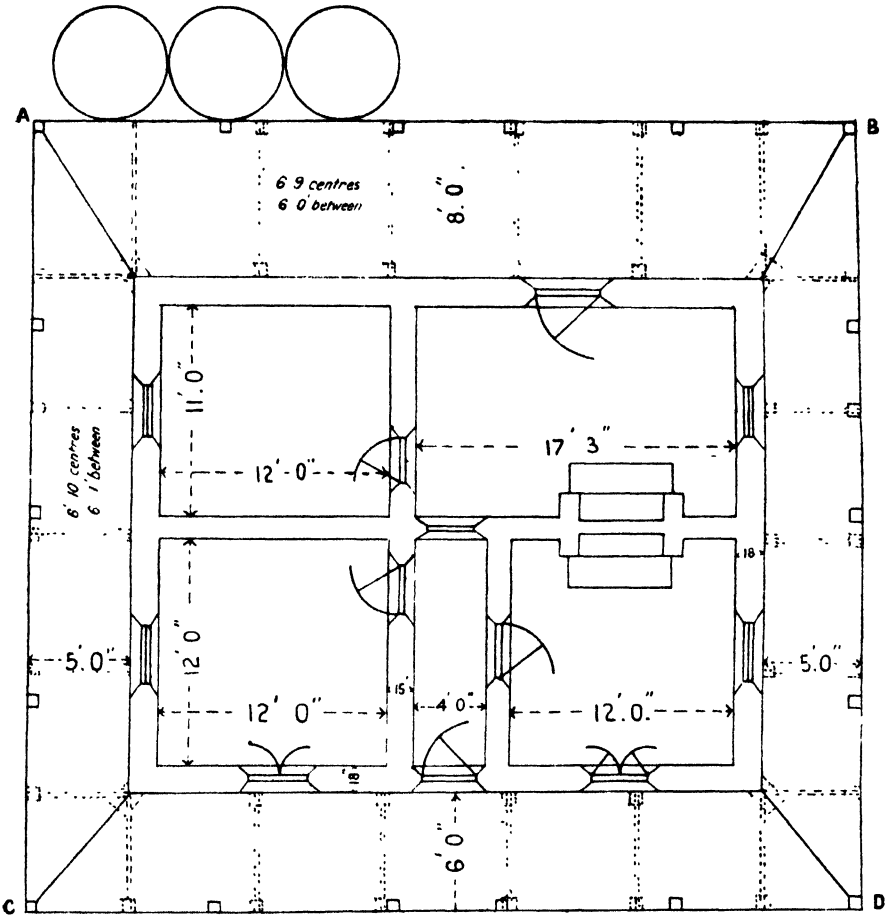
Remove the turf to make footings, but not deeper at any place than 3 inches. Step where required.

Bricklayer.

Chimneys.—Build a double chimney where shown. Openings : Front room, 3 ft. x 3 ft. ; kitchen, 3 ft. 9 in. x 4 ft. 6 in. wide. Breast to be carried up to ceiling, and to be struck on the inside. The arch in sitting-room to be semicircular ; the arch in kitchen to be turned on 2 in. x $\frac{3}{8}$ in. iron cambered bars. The stack to be carried 3 feet higher

than the roof; the flues to be 9 in. x 14 in., and to be well parged (or plastered). Build hobs to inner hearths; outer hearths to be rendered with ¾-inch coat of good cement

Verandah Piers.—Build four (one at each external angle) 14 in. x 14 in. piers to carry bearers for verandah. Build two rows of 9 in. x 9 in. piers, one row against wall and the other at outside plate, to be spaced



Ground Plan.

not more than 6 ft. 3 in. apart. The piers to have footings to a depth of 3 inches below the surface of the ground. The whole to be built in good lime mortar, and the external piers finished with neat-struck joints.

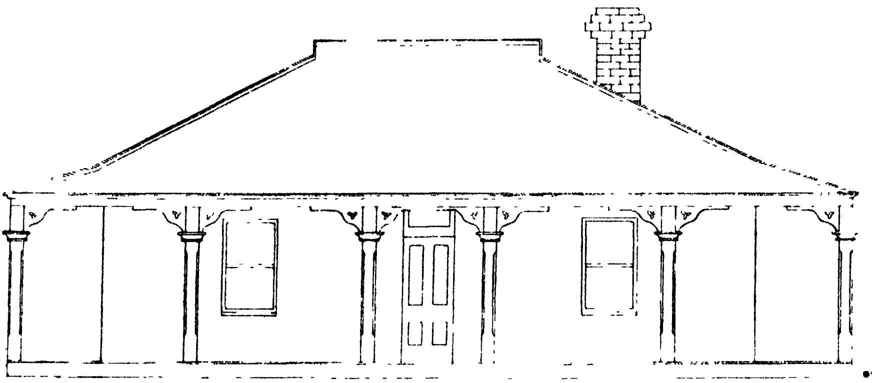
Internal Piers.—Build similar 9 in. x 9 in. piers to carry inside floors; these need not be struck, but are to be well grouted. There are to be four rows in kitchen and three rows in each of the other rooms.

PISÉ BUILDER.

Walls.—Erect the walls as shown on plan, external walls 18 inches, internal walls 15 inches, carried up plumb and true, with all cross walls properly bonded by continuing the pisé-boxes around all angles; when necessary, the material for the walls is to be properly tempered with sufficient water before it is dry. All sticks and vegetable matter are to be removed. *Suitable material will require to be a pipe-clay loam, with a trace of small gravel evenly distributed through same. The boxes to be filled in thin layers of 4 inches at a time, and well rammed until solid; the workmen are not to use their rammers in unison.

The whole of the internal angles, also door and window jambs, to be neatly splayed, as shown.

Floating.—Moisten well the outside and inside walls before the floors are laid, and float same to even smooth surface with wooden hand-float, using weak plaster where required.



Front elevation.

Bolts.—To hold down wall-plates, provide and build in ½-inch bolts, not less than 15 inches long and spaced not more than 6 feet apart.

Damp-course.—Below all walls lay a three-ply Ruberoid damp-course the full width of walls, to lap at ends at least 4 inches.

Ventilators.—Insert below floors, where directed, four 9 in. x 6 in. galvanized-iron air gratings, in wooden frames 1½ inches thick by full width of walls; also insert at about 18 inches below ceiling similar air gratings and frames.

Plugs.—Insert plugs (see "Carpenter") 3 feet apart for skirting, chair and picture rail, at the heights as directed.

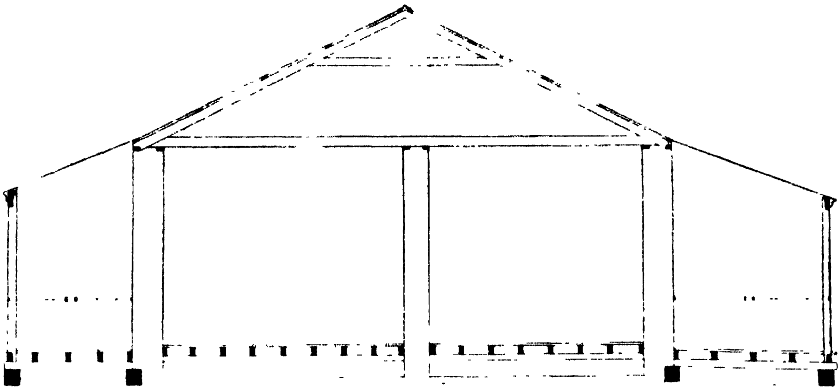
Hoop-iron.—Insert in walls hoop-iron ties, twisted and bent at right angles, to secure verandah floor-bearers.

* This is specified because it was the best material near site.

Frames.—Set all frames plumb and true, and secured in wall before removing head, as per Carpenter's specification. Lintels and heads must be well and solidly bedded in mortar, at proper heights. The whole of the work to be done in a proper workmanlike manner.

CARPENTER.

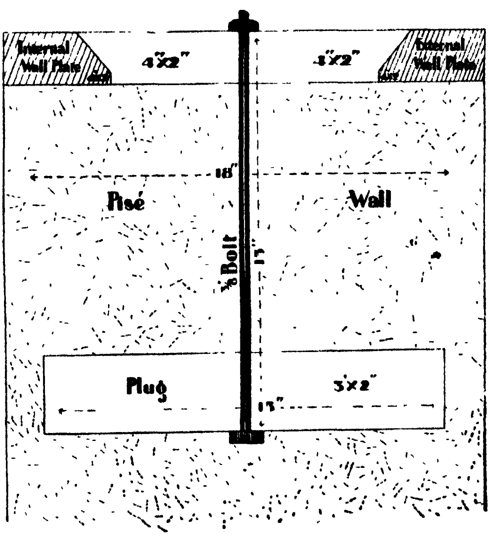
Floors, Bearers and Joists.—Construct floors to main building with 4 in. x 4 in. Cypress pine bearers, well bedded on piers, one on each side and one in centre of rooms, except in the kitchen, where there will be



Cross section.

four bearers. Fix on bearers 5 in. x $2\frac{1}{2}$ in. Cypress pine joists, spaced not more than 1 ft. 6 in. centres, well nailed to bearers. Cover the floor of main buildings with 6 in. x 1 in. T. and G pine flooring, well nailed and punched, and cleaned off on completion. All ends of flooring to be bored.

Ceilings.—Provide and fix 6 in. x 2 in. ceiling joists, and secure to inner and outer 4 in. x 2 in. pine wall-plates, same to be kept even with wall on both sides, scarfed at heading and angle joints, framed as per detail, and well secured to walls with bolts provided and built in by pisé builder. Ceiling joists to be spaced at not more



Detail showing method of fixing external and internal wall-plates.

than 24-inch centres, and to be trimmed at ends and chimneys, as required. Line ceiling with 6 in. x $\frac{3}{8}$ in. T. and G. Cypress pine. Provide manhole where directed, and finish all round at intersection of walls and ceilings with 2-inch scotia.

Roof.—Provide and fix hip roof with 4 in. x $2\frac{1}{2}$ in. rafters, spaced not more than 3 feet centres, securely fixed to wall-plates and ceiling joist at bottom, and cut to fit 6 in. x $1\frac{1}{2}$ in. ridge and hips; the ridge to be extended as shown, and the whole of the roof prepared for iron with 3 in. x $1\frac{1}{2}$ in. Oregon battens, spaced to suit iron.

Gablets.—Provide and fix two ventilating gablets as shown, about 21 inches high, fitted with 24 gauge iron, louvres having steep pitch, and not more than $1\frac{1}{2}$ inches apart, with edges turned up and down as required. Gablets to have 4 in. x $2\frac{1}{2}$ in. centre upright, and to be finished with roll on iron and neat-cut barge. Fix gutter-boards at back of chimney for plumber.

Collar-ties.—Fix securely to each pair of rafters 4 in. x $2\frac{1}{2}$ in. collar-ties.

Verandah Floors.—Provide 5 in. x 4 in. pine outrunning-bearers with about $1\frac{1}{4}$ inches fall outwards, secured to walls with the hoop-iron plates provided by Pisé Builder. The bearers to be well bedded on piers, and to be spaced not more than 6 ft. 3 in. apart. Upon the bearers fix 5 in. x $2\frac{1}{2}$ in. pine floor joists, with centres not more than 18 inches apart, laid straight, and with proper fall outwards. The outside joist is to be dressed with $\frac{1}{2}$-inch bead on lower edge, and is to be neatly scarfed at heading joints. Cover the floor with 6 in. x 1 in. dressed and shot-edge pine flooring, well cramped up and nailed.

Verandah Posts.—Construct verandah with 5 in. x 5 in. dressed and stop-chamfered pine posts, wth 3 in. x 2 in. cap-mould and small bracket, to detail, the posts to be spaced as shown, and to be scarfed for outer joists and for 7 in. x $2\frac{1}{2}$ in. top plate: to be bolted through plate and joists with $\frac{3}{8}$-inch bolts.

Plate.—The top plate to be dressed, and to be halved and bolted through on top of posts where joined.

Hips.—Fix 4 in. x 2 in. hips at angles with top side flush with plates.

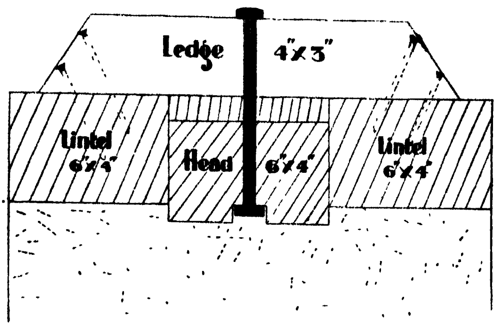
Fascia.—Provide and fix 6 in. x 1 in. dressed and beaded fascia on ends of ceiling joists and plate, to cover the whole of the edge of the wall-plate.

Fillet.—Finish against intersection of floor and wall with neat $1\frac{1}{2}$-inch quarter-round fillet, scribed to wall and floor and nailed to floors.

Door Frames.—Construct outside door frames for 6 ft. 8 in. x 2 ft. 8 in. doors with 16-inch pivot-hung fanlights, and 4 in. x 2 in. transoms, moulded as required. The front door is to be bolection moulded outside, and to be hung with 4-inch butt hinges to 5 in. x 4 in. properly mortised and tenoned frames to suit pisé work, as per detail.

Stiles to be 5 in. x 4 in., heads 6 in. x 4 in., and sills 15 in. x 3 in. Stiles to be sunk $\frac{3}{8}$ inch into head and sill, and to be fixed in centre

of walls. Sill to be flush with back of stiles, and rebated to receive flooring, and also to project 2 inches in front of wall, extending 8 inches into wall at each end, with neat rounded nosing returned at ends. The heads to extend 12 inches over stiles, and to be secured to 6 in. x 4 in. dressed lintels at each end with 4 in. x 3 in. shaped pieces, nailed to lintels and bolted to head as shown.



Detail showing shaped piece bolted to head.

Inside doors to be 6 ft. 8 in. x 2 ft. 8 in. x 1½ in. American pine, and the doors hung with 4-inch butt hinges. No fanlights required. The frames to have 5 in. x 4 in. stiles and heads, and 5 in. x 2 in. sills, to be made 7 inches longer than doors, so that top of sill will be level with sleeper-plates. The whole to be properly mortised and tenoned together, but sills will not require to be dressed. The heads and sills are to extend 12 inches over stiles into pisé work at each end, and the heads are to be secured to lintels as directed for the outside door frames.

The heads are to be left loose in the mortise, and when finished are to project ½ inch below the underside of lintels.

An alternative and better method of constructing door and window frames, is to fit splayed jamb linings to the stiles. If this plan be adopted the specifications relating to the stiles of the door and window frames will be as follows :--

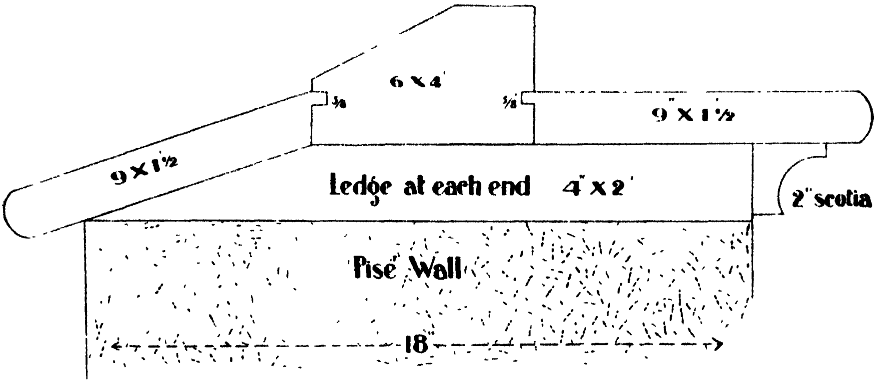
The stiles to be 5 in. x 3 in. and to be grooved all round to take 1½ in. splayed linings, kept flush on back of stiles and strengthened with 2 in. cleats screwed on back of stiles and splayed lining to stiffen same. The outside edges of linings to be flush with inside and outside walls to receive architrave.

The pisé builder will require to build into wall at all window and door openings 3 in. x 3 in. shaped plugs, spaced not more than 3 feet apart to secure architraves.

Door Furniture.—Provide and fix to internal and back doors 6-inch Vaughan's rim locks, with best furniture. Provide for front door a 7-inch American draw lock and a neat bronze knocker and knob.

Window Frames.—Construct window frames to take sashes 5 ft. 2 in. x 2 ft. 10 in. x 1½ in. with upright bar in centre. The frames to have 5 in. x 4 in. stiles and sills, and 6 in. x 4 in. heads; the whole to be properly framed similar to door frames, but sills to be weathered and grooved on both edges to secure window-boards, as per detail.

Box frames can be substituted for solid frames, if desired, by altering the specification to the following:—Construct proper box frames for windows, having 1¼-inch pulley stiles, 1¼-inch out and inside linings, ⅜-inch parting beads, ⅝-inch stop beads, and 1¾-inch Kenrick's axle pulleys. Where splayed linings are adopted add:—The outside and inside linings to be grooved for 1½-inch splayed jamb linings kept flush with outside and inside walls to receive architraves.



Detail showing method of framing window boards to stile.

Lintels.—For all door and window openings provide 6 in. x 4 in. well-seasoned dressed pine lintels, to extend 12 inches into pisé work on each side of opening.

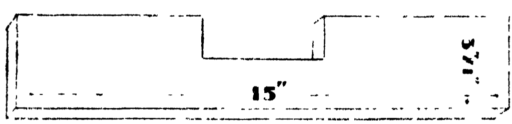
Sashes.—The sashes to be secured with ⅝-inch stop-beads, mitred at angles. The bottom sash to lift up and secured with brass holdfasts; the stop to be binged, to allow top sash to drop 6 in., with small brass knob, complete. Secure sashes with Ives' patent sash-fastener.

Priming.—The whole of the frames and joinery to be primed previous to fixing.

Mantels.—In front room provide and fix plain moulded mantel with 1½ inch backgrounds, moulded base and 1½-inch shelf. In kitchen provide 1½-inch mantel-shelf supported by 2-inch brackets.

Skirting.—Provide and fix in all rooms, to plugs about 3 feet apart, 6-inch O.G. moulded redwood skirting, neatly scribed to floors, mitred at angles as required.

Picture-rail.—Provide 3 in. x 1 in. beaded picture-rail to all rooms.



Detail of plug.

Chair-rail.—To all rooms fix 4 in. x 1 in. beaded chair-rail, well secured to plugs.

Plugs.—Prepare and tar for pisé builder 3 in. x 1 in. well-seasoned soft-wood plugs, 15 inches long, as per detail, for skirtings, picture and chair-rail, to be inserted 3 feet apart.

PLUMBER.

Roof.—Cover the whole of the roofs with 26 gauge galvanized iron, well screwed to battens, with $1\frac{3}{4}$ in. x 12 gauge galvanized screws and lead washers; the whole of iron at ridges, hips, &c., to have the hollows turned up. All side laps to be not less than $1\frac{1}{2}$ corrugations, and end laps to be not less than 6 inches.

Fix 6-inch quarter-round 26 gauge gutters to eaves of verandah on strong gutter brackets, made of not less than No. 10 gauge hoop-iron, and spaced not more than 2 ft. 6 in. apart, to have straps bolted through brackets and passing up and secured to iron. Provide and fix one stack of 3-inch down-pipe to tanks where shown. The whole of the gutter to be strongly soldered. Cover the ridges and hips with 16-inch ridge capping, neatly fixed.

Chimney.—Flash chimney with 4-lb lead, and fix gutter at back with 24 gauge galvanized iron, all neatly pointed-up, and with apron-piece complete.

Barn, store, and office built of Pisé. Cowra Experimental Farm.

PAINTER.

Paint the whole of the woodwork outside usually painted, with three coats of best white lead and B. and S. raw oil, finished in colours as directed. Paint doors, windows, skirtings, rails, &c., in three coat work, as before specified. All ceilings to have one coat of size and two coats best oak varnish. Gutter to be painted with one coat of Indian red. The margin edge of verandah, 6 inches wide, to be painted red. Walls inside and out to be lime-coloured.

Other Earth Buildings.

MUD AND STRAW, OR "PUG."

These buildings possess the advantage that they can be erected very cheaply, and without any expenditure for special plant. The material is prepared by mixing thoroughly-wetted earth and straw together. On a small scale this is done with a fork-hoe in a hole dug by hand; on a

large scale it is done with the aid of horses attached to harrows in a trench which has been ploughed out. The foundations having been marked out, the building is erected by placing the thoroughly-wetted material layer by layer, each layer about 12 inches thick, until the desired height is reached. One layer is allowed to become somewhat dry or set before another is added to it, and as the building proceeds, at intervals of 3 to 4 feet, the walls are trimmed down with a spade to a straight and upright face, and an even thickness of 10 inches to 12 inches, by the aid of a line and plumb-rule. On account of the material being used in a wet state, there is a considerable amount of shrinkage; and because of this the stiles and heads of the door and window frames are not usually inserted until the completion of the building, when the openings are trimmed down to receive them. These buildings prove very solid and warm, and are likely to stand more direct exposure than pisé.

Studding, Wire-netting, and Pisé.

This is a modification of pisé, which provides a settler in a district where poles or saplings are available with a quick method of providing himself with a comfortable temporary residence without the expenditure of much cash. To construct buildings of this character, a framework of saplings or poles, at intervals of 3 ft. 6 in. to 3 feet apart, is first erected; this framework is covered on both sides with 1¼-inch mesh wire-netting. The two sections of netting are held together, strengthened, and prevented from stretching and bulging between the posts by means of wire hooks or loops, which are as long as the posts are wide. The spaces thus enclosed by the netting and the poles are then filled with earth, which is well rammed, thus making a solid wall 4 inches to 6 inches thick. This wall can be plastered, the plaster forming a key with the wire-netting, which holds securely. Buildings of this character can be made to look rather attractive, and, if neatly constructed, are very much superior, both in appearance and comfort, to slabs or wattle and dab.

"Adobe," or Sun-dried Bricks.

As their name implies, these buildings are constructed of sun-dried, but unburnt, bricks. For buildings of this character, material like clay, which is unsuitable for pisé work, can be used. The bricks are made in a wooden mould, and are 16 inches long, 8 inches wide, and 6 inches thick. A man can mould about 100 per day. They are laid in a similar manner to other bricks, the mortar used being wet loam, or even the material of which the bricks are made. The cost of making and laying is estimated at about 15s. per 100. Buildings constructed of these bricks are substantial and cool, and are very similar in character to pisé buildings.

A school-house built of these bricks eighteen years ago, by Mr. Nixon, of Reefton, is still in an excellent state of preservation; in fact, little, if any, the worse for wear, despite the fact that walls are unprotected by verandahs or overhanging eaves. During its existence, it has had, first, one coat of oil-paint, and later a coat of coloured limewash.

Sheep at Bathurst Experimental Farm.

R. W. PEACOCK.

THE cross-breeding of sheep to gain information respecting the most suitable crosses for the production of exportable lamb and mutton has been carried on for many years at the Bathurst Experimental Farm.

Shropshire-Merino—1 year 10 months.

Lincoln-Merino—1 year 10 months.

An interesting exhibit, comprising fifty-four sheep, was shown at the New South Wales Sheepbreeders' Association Show, in June, 1907.

In addition to exhibiting the various crosses in pens as live sheep, one each of twelve pens was slaughtered and hung up for two days of

the show. Particulars as regards breeding, age, live weight, dressed weight, skin, and internal fat were given upon cards attached to the carcasses.

In order that the quality of the mutton could be the better seen the carcasses were cut through the ribs, the proportion of lean and fat, &c., being plainly discernible.

Visitors were thus able to gain a better idea of the mutton qualities of the crosses. Such, in conjunction with the live sheep, provided an exhibit decidedly educational, and which was fully appreciated by those interested in the sheep industry.

The following are the particulars:—

Breed.	Age.	Live Weight.	Dressed Weight.	Skin.	Fat.	
	y. m.	lb.	lb.	lb.	lb.	
Lincoln-Merino	1 10	156	95½	22	12	
Shropshire-Merino	1 10	156	87	19	12	
English Leicester-Merino	1 10	154	85	21	16½	
Southdown-Merino	1 10	138	76	16	13½	
Lincoln ram on Shropshire-Merino ewe	1 10	135	85	16	10	
Southdown ram on Southdown-Merino ewe	1 10	140	84½	17	14	
Merino ram on English Leicester Merino ewe	1 10	131	71½	22½	12	
The hogget skins had eight months' wool.						
Weaners.						
Lincoln ram on Shropshire-Merino ewe	0 10	130	73	21	7	
Lincoln-Merino	0 10	120	63	24	7	
Shropshire-Merino	0 10	110	60½	21	8	
Southdown-Merino	0 10	105	59½	16	9	
English Leicester-Merino	0 10	102	57	15	8	
The weaners had ten months' wool.						
Merino ram on Lincoln-Merino ewe	1 10	116¼				Comebacks.
Merino ram on Border Leicester-Merino ewe	1 10	122¼				Comebacks.
Lincoln ram on Shropshire-Merino ewe	0 10	123½				Second Crosses.
Shropshire ram on Lincoln-Merino ewe	0 10	112½				Second Crosses.
Shropshire ram on Border Leicester-Merino ewe	0 10	112½				Second Crosses.
Merino ram on Lincoln-Merino ewe	0 10	102½				Second Crosses.
Merino ram on Southdown-Merino ewe	0 10	97½				Comebacks.
Merino ram on Shropshire-Merino ewe	0 10	95				Comebacks.
Merino ram on Border Leicester-Merino ewe	0 10	92½				Comebacks.
Merino ram on English Leicester-Merino ewe	0 10	91				Comebacks.

The live weights given for the unslaughtered sheep are the average weights of the sheep weighed at the Farm prior to sending to Sydney, and are comparable.

The dressed weights, as will be seen, are heavy, and the carcasses in many instances too fat for the market. It is fully recognised that for market they require to be lighter and not so fat. For market purposes the sheep would have been sold when prime at much younger ages.

As a demonstration of what could be done under a system of mixed farming the exhibit was valuable.

It is interesting to note the effect of the greater infusion of the blood of the British breeds upon the weights of the carcasses. The second crosses were much heavier than the first crosses.

The decrease in weight by the larger proportion of merino blood in the Comebacks is also worthy of notice.

In the first crosses the Lincoln-Merino gave the heaviest carcass, followed by the Shropshire-Merino.

As regards attractiveness of carcass, the Southdown-Merino and Shropshire-Merino were first followed by the English Leicester-Merino.

As regards weight of skin, the Lincoln Merino was first, followed by the English Leicester-Merino and Shropshire-Merino.

The skin of the Comeback weighed heavier than either of the first crosses.

Hind quarters of Hogget 1 year 10 months.
By Southdown ram from Southdown-Merino ewe

Section of Mutton of Lincoln-Merino Hogget.

Ramie, Rhea, or China-grass.*

H. V. JACKSON.

In consequence of paragraphs appearing in the Metropolitan Press upon the subject of Ramie fibre, its value as a product, and the materials manufactured therefrom, many cultivators of the soil are anxiously making inquiries about the plant, and some are applying for cuttings, roots, or seeds, with which to make an initial planting. In the anxiety to get hold of something that will pay in these days of low prices and competition, I fear some of those who ask for plants or seed do so in entire ignorance of what they are asking for, or the manner in which the resultant product from the plant, in the first instance, requires to be treated before there is a possibility of sale, provided there is, in course of time, a local market for the green stems, or for the stripped bark, or so-called ribbons; therefore, it seems not only appropriate, but necessary, some plain, unvarnished tale should be told as to what Ramie is, and its position as a marketable commodity. *Bœhmeria* (named after George Rudolph Bœhmer, a German botanist) is of the order *Urticaceæ*—a genus of shrubs, or herbaceous plants, allied to *Urtica* (true nettles), from which it is distinguished in not having stinging hairs.

Bœhmeria nivea (snowy) is the one particularly under notice. Flowers, greenish, disposed in spikes; leaves broadly cordate, about 4 inches to 5 inches long by 2 inches to 4 inches broad, terminating in a long slender point; edges serrate, covered on the underside with a coating of white down; height 3 feet to 4 feet.

This variety is the Tchou-ma of the Chinese, the Rhea of Assam, and the Chinese grass-cloth plant of English writers. It is not a newly-discovered thing of to-day, so far as the manufacture of grass-cloths is concerned, but has for long been cultivated, used, and exported by the Chinese. The grass-cloth is manufactured from the fibre obtained from the inner bark of the stems of the shrub. The Chinese bestow much care on its cultivation and the preparation of the fibre. They are reputed to obtain three crops a year. The fibre is of different degrees of fineness, according to the age of the plant, and the part of the bark from which it is taken, the inner bark of young, quickly-grown stems yielding the fine, delicate fibre from which superior fabrics are manufactured, while other portions are used for rope-making, &c.

* Reprinted from the *Agricultural Gazette* of April and November, 1898.

Authorities referred to in compilation of this article :—"A Report on the Cultivation of Ramie in the United State," by Chas. R. Dodge, 1895; "Rhea: Its Cultivation, &c.," Rhea Fibre Company, 1896; "Some Notes on Ramie," Mon. Ch. Riviere, 1897.

RAMIE OR RHEA (BŒHMERIA NIVEA).

A. *Female flower.* B. *Male flower.* C. *Seeds.* D *Cluster of female flowers* E *Seed (magnified)*

There is another variety, *Bœhmeria paya*, a native of Nepaul, India, closely resembling *B. nivea*. This plant is called Pooah, or Paya, in Sikkim and Nepaul, where the natives use it largely. It makes excellent cordage and sail-cloth. In the Sandwich Islands, also, another variety, *B. albida*, is used for making native cloth.


Ramie Canes.

Of late years English and French manufacturers of ladies' dress materials, fancy curtains, plush materials, &c., have not only made considerable strides in the production of more than usually beautiful Ramie or Grass-cloth textures, both as regards patterns and quality, but as an adjunct with silk, in the production of "silk mixtures," it has come greatly into use. With an enlarged sphere for usefulness, and consequent increased demand for the fibre, the manufacturers, in their own interests, have endeavoured to advertise the advantages of Ramie culture in those British and French colonies where the climate and natural conditions were likely to be favourable, and the busy Americans have also got hold of the idea that there may be something in Ramie culture; consequently, in the United States, in British India, Ceylon, Jamaica, Barbadoes, &c., Ramie is being talked about, written about, and experimented with. In the cultivation of Ramie under more modern conditions, the difficulty has been to obtain machinery that would treat the green stems in such a way as to produce a saleable substance, either in the form of ribbons or fibre, it being recognised an advance upon the primitive means adopted by the Chinese was necessary. There are, apparently, several rival machines now offered by English and French manufacturers differing in their resultant product, some making ribbons, some fibre, and others a sort of filasse.

The mention of these machines brings me now to what I think prospective growers of Ramie in this State should clearly understand—viz., that the green stems of the plant have to be treated by mechanical or chemical means to obtain either "Ramie ribbons" or "Ramie fibre" before the grower can say he holds a marketable product. If the grower is not able to produce "ribbons" or

"fibre" from his crop, then it is practically valueless, unless there is someone in the locality, whether it be a co-operative company, or syndicate, or private person, with a machine, who will either buy the green stems or treat them for the grower at a price to be agreed upon. What I wish to emphasise, in order that poor persons may not lose time or money, is that the grower cannot go and gather his crop off the Ramie bush, and bag it, and market it right away like he would do so much maize—at least, not at present; in fact, not until some neighbour or himself has the necessary machine to treat the stalks.

Now, as to the returns from Ramie there are very conflicting opinions and reports, and in this State we have not yet reached that stage of the experiment where we can say positively, from actual practical crop cut, decorticated and marketed, what a crop of Ramie per acre will bring to us.

In the *Tropical Agriculturist* (Colombo), recently, I read that Dr. D. Morris, the Assistant Director of the Royal Gardens, Kew, stated, in a lecture delivered in November, 1896, that the value of Ramie ribbon was £8 per ton in London; then a Mr. E. Matthieu, of Singapore, quotes from actual experiments made for two years at Buitenzorg, Java, and says 1 bhow (1¾ acre) gives four cuttings in one year, weighing 74,000 lb. of green stems, stripped and topped, 1 acre giving 42,800 lb. of stripped and topped stems.

A Mr. Wray, junr., who prepared a report for the Perak Government, says he finds the mean yield of fibre per acre to be 1,173 lb. (10 cwt. 1 qr. 25 lb.), or of "ribbon," 1,656 lb. (14 cwt. 3 qrs. 4 lb.).

Now, in reference to the plot of Ramie at the Wollongbar Experimental Farm, in August, 1895, 980 plants from divided roots were set out in a plot $\frac{1}{16}$th of an acre, and cut twice during that year, the first being a "waste-cut." During 1896 three cuts were obtained, yielding each an equivalent to about 9 tons of green stems per acre; the stripped bark or "ribbons" yielded each cutting from 456 to 520 lb. per acre, or a total of, say, 1,464 lb. per acre. For comparison the various statements may appear as under:—

	Acres.	Cuts	Green Stems. lb.	Ribbon. lb.	Fibre. lb.
Buitenzorg .	1	4	42,800	..	1,605
Perak	1	.	..	1,656	1,173
Experiment Farm .	1	3	60,480	1,464	1,037

Accepting the value put upon Ramie "ribbons" by Dr. Morris, of Kew, at about £8 per ton in London, the 1,464 lb. of ribbon estimated as the yield per acre, would have brought £5 4s. 7d; and if decorticated and sent as "fine dry fibre," at about Mr. Matthieu's estimate of, say, £24 10s. per ton, the 1,037 lb. of fibre, the estimated product from 1 acre, would have brought £11 6s. 10d., from which the cost of production, rent, charges, interest, and freight, would have to be deducted. The figures are based on Perak and Wollongbar estimates of quantity. If we take Buitenzorg figures only, then the estimate for our experiment farm would be 60,480 lb. green stems, producing 2,268 lb. fibre, worth £24 16s.

Regarding "yield in fibre," Mr. Matthieu, says it is dubbed ribbon, raw fibre, clean fibre, dry fibre, filasse, without these words conveying any true

Ramie Fibre.

idea of the purity or money value. Mr. Matthieu adopts "clean dry fibre," and takes as the average of several experiments (chiefly with the Faure machine) an average of 3·75. He says:—"My estimate of yield of Ramie stems, stripped of leaves and topped, stands as shown above 20 tons per acre per annum. Green stripped stems yield 3·75 per cent. of their weight in clean, dry fibre, as sample No. 2, worth £32 in London; therefore, 20 tons of green stripped stems, the aggregate yearly crop of 1 acre, will give 1,680 lb. of fibre, worth £24 in London. Continuing, he says it is possible to materially increase the profit by partially degumming the fibre:—

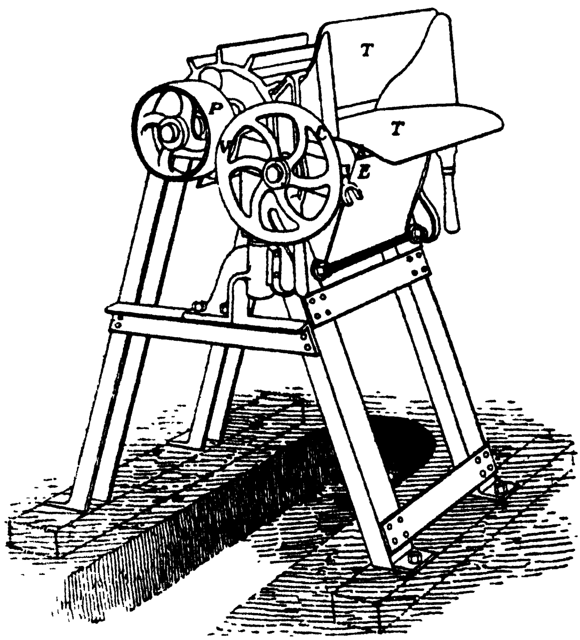
"Degumming, when the gum is yet fresh and fluid, offers very much less difficulty than when it is hardened, as in the case when the fibre is sent simply dried to Europe. Any one can satisfy himself on this point by boiling freshly stripped Ramie in water for, say, one hour: it will be seen that the fibre loses a notable quantity of its gum. If the boiling is kept up for several hours, and a small quantity of washing-soda added, or soft green soap, the reduction of the gum will be yet more complete: if the boiling is made under pressure in autoclave kiers an almost complete degumming can be obtained; but beyond the fact that pressure implies more or less complication, it is not necessary nor desirable to carry the degumming so far, because in the presence of a perfectly finished fibre the spinner is apt to suspect the use of injurious chemicals: he prefers, as in the case of hemp and flax, to finish off the process himself."

Mr. Matthieu thinks the best market for the fibre is China, since, while he puts the whole production of Ramie (China-grass) at 11,000 tons, the export is only 2,000 tons, the rest being used for local manufacture.

In contradistinction to Mr. Matthieu, the same paper quotes the opinion of Mr. J. M. MacDonald, of Messrs. MacDonald, Boyle, & Co., London, who recommends that the material to be exported should take the form of filasse, to be prepared by means of a machine in which he is interested. The degummed and treated fibre, he contends, will readily command £42 in England. In a letter written just before leaving Ceylon, Mr. MacDonald says:—"Get 40 tons (that is, of stems free from leaves) per acre, and Ramie begins to pay: but nothing under 30 tons will pay." Mr. MacDonald bases his original quotation on large acreages—*i.e.*, the smaller the plantation the greater the proportionate cost of producing a pound of prepared fibre. He upsets any previous ideas as to the amount of produce per acre; and for harvesting advises this should go on continually, so that the sticks fit for cutting will be gathered at the proper time; periodical cuttings he does not believe in. Mr. MacDonald appeared to be sanguine of success when visiting the Ceylon planters, and his firm identify themselves with growers to the extent of charging a percentage on the net profits of the crop treated by their machine.

As to the cultivation of Ramie, it requires a free loam, with plenty of atmospheric moisture and good natural drainage. It is readily propagated by division of the roots, or by root-cuttings made about 4 inches long. It does

not readily come from seed. June and July are the best months for sowing; but the usual wet season of the northern district is favourable. The stems are considered matured when the bark at the bottom changes from greenish to a brown colour. The secret of success in the production of good Ramie fibre, is to promote the growth of long straight stems, with few laterals, and naturally this is arrived at by close planting. On a plot recently laid out, I planted cuttings in rows 2 feet wide and the cuttings 9 inches apart. Mr. MacDonald recommends planting the cuttings 1 ft. x 1 ft. at first, and afterwards taking out every other plant. In this connection, however, experiment will in time show what system is best here. The plant may



Faure's Ramie Decorticating Machine.

show a different disposition in our soil and climate to what it has elsewhere; but there is no difficulty in propagating the plant in a sufficiently warm and humid locality. For treating the Ramie stems at the Wollongbar Farm, a "Faure's Ramie Decorticating Machine" has been imported, and it is claimed for this machine that it forms the connecting link so long sought for between the grower of Ramie and the spinner and the manufacturer of the fibre. Previous inventors of Ramie decorticators have concentrated their efforts to produce "ribbons," and it is alleged Ramie ribbons have their serious, almost fatal, defects. They contain a large percentage of woody matter; they contain the outer skin or cuticle of the stem, which has been the despair of the chemist to solve and remove, and they are gummy.

The Faure machine does not produce "ribbons" but "fibre." It weighs 11 cwt., and the motive power may be of any kind—steam, gas, oil, electric, or water. The power required for driving the machine is one indicated horse-power; but where a number of machines are at work, less power is required, *i.e.*, an engine indicating 8 h.-p. will drive ten machines. The driving pulley of the machine is 10 inches diameter, and it must run at 550 revolutions per minute. When fixing the machine, two wooden sleepers about 5 feet long, 10 inches wide, and 8 inches thick should be bedded firmly in the ground, and the machine secured to them by means of four coach bolts, special care being taken that the machine is perfectly level.

The principle of the machine is beating the stems by means of a revolving drum with beaters, as the stems are drawn between the drum and a feed-bed. Between the beaters of the decorticating drum and the feed-bed there must be left, when set together for working purposes, a space equal to the thickness of a sheet of writing-paper. The beaters must never under any circumstances come in contact with or touch the feed-bed. By means of a hand-wheel the feed-bed is set nearer to or further from the beaters. This hand-wheel carries a copper pointer, which, when it is at the top, indicates that the feed-bed has arrived at its extreme limit of setting. The best means for a practical adjustment is afforded by the sound made by the revolutions of the beaters. A little experience with this sound soon indicates the setting best suited to the nature and resistance of the stems of Ramie under treatment. The sound varies exceedingly according to the more or less proximity of the beaters to the feed-bed. Each adjustment requires that a shaft at rear be well fixed. This is done by screwing up a nut placed for the purpose. The adjustment varies according to the number of stems that are being fed into the machine. In practice the largest possible number of stems are fed in simultaneously; consequently when the machine has been once properly set, the setting will last for a long time.

Two men are required to feed each machine with stems, the one working on the right and the other on the left hand. One of the men takes the requisite number of stems—say, as many as he can well hold in one hand—being careful to put the thick or root end of the stems all in line. He inserts the stems into the machine, the thick ends first for a distance of about 18 inches, and draws them out again. He then turns his handful of stems and feeds them gradually into the machine thin ends first, being careful to grasp firmly in his hand the fibre which has already been decorticated. He then withdraws the fibre, which comes out very clean, having been expanded or spread out on the feed-bed. In order to withdraw the fibre without damaging the filaments, the workman must use his other hand as well, and act exactly as a fisherman does when he draws his net out of the water. During the time that the first workman is thus at work, the other takes his handful of stems and prepares to act exactly as his comrade is doing. The operations are effected in such a rapid manner that the time required by one workman for decortication and disposing of the fibre corresponds exactly

with the time required by the other for taking his handful of stems and preparing them for insertion in the machine. The result is the continuous working of the decorticating drum, which is continuously treating large quantities of stems. The two workmen, with stems in fairly good condition, will decorticate per hour about 360 lb. of green stems in exactly the condition they are in when delivered from the field—that is to say, topped, but with their leaves on, which is equivalent to a production of about 160 lb. of dry fibre per day, more or less, according to the percentage of fibre contained in the stem.

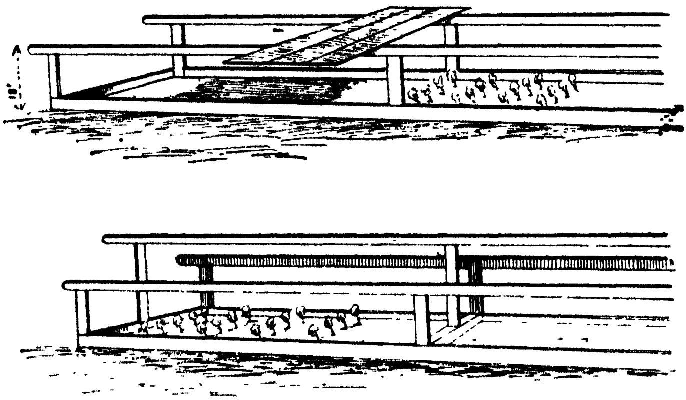
The two main parts of the machine must never come into actual contact. If this is observed the wear and tear is very small indeed, as it proceeds solely from the resistance of the green stems under treatment. The machine never chokes with the débris. Although constructed with great accuracy, no special intelligence or knowledge is required in working; consequently the decortication can be carried out by ordinary agricultural labourers. Owners of machines are advised to insist on the machine being perfectly cleaned and lubricated at the end of each working period—say, twice a day. With the woody portion, there falls a small quantity of fibre, termed "waste" It is of sufficient value to be collected and saved, being useful for the twine, cord, and paper trades. The condition of the stems play an important part. As before stated, they should be straight, free from branches as much as possible, because wherever there is a branch the continuity of the fibre is broken. The plants should therefore be cultivated under conditions promoting long and straight upward growth. The stems can be fed into the machine in all degrees of maturity, size, and length. When cutting the stems in the field they should be topped. After leaving the machine, the fibre should be washed in clean water, hung on lines to dry, and then made up into hanks, and packed in bales for shipment. In treating the fibre on a large scale, it will be found advantageous to boil it for an hour in water, then rinse out and dry. This will in a great measure degum the fibre, especially if 1 per cent. of carbonate of soda to the water is used. The price of the Faure machine in London is £36.

The information given herein is sufficient to show that there are possibilities of Ramie cultivation being a useful adjunct to other farm or plantation work in suitable localities; but it would hardly be wise for settlers to rush into cultivating the plant without some assurance of finding a local means to produce the marketable fibre. The Government having imported a machine, and there being a sufficient stock of nursery plants to lay out an acre or two under Ramie, a few months should enable a tangible test to be made of the quantity, quality, and price obtainable for Ramie grown in the State.

Cultivating and Harvesting Ramie.

The variety grown at the Wollongbar Experimental Farm is known as *Bœhmeria nivea* (Hook and Arn). It is said to grow to perfection in a temperate climate, such as that of Northern China, and for this reason it is supposed

to stand a considerable amount of cold. No doubt it will live through a considerable fall in temperature, but experience at Wollongbar this winter goes to show that it suffers from frost. There is no doubt whatever that a warm, moist atmosphere, a good rainfall, an absence of prolonged dry spells, and a well-drained soil constitute the essential requirements of the plant when the best results are desired in the matter of growth. At the same time, where very prolonged rains are experienced, there is always a possibility of the too succulent plants producing a softer fibre and in less quantity than is desired. That can only be proved by experience. The plant is hardy, and will grow almost anywhere, but responds to suitability of surroundings, soil, climate, and cultivation. In very poor land manure would be necessary. In stiffish land, where there is any likelihood of inferior natural drainage, the plant should be set in hilled land, but in the free-drainage soil peculiar to the red-soil uplands, such as Wollongbar, the plants may be set in drills without hilling. The subsoil should, however, be broken with a subsoil plough to enable the roots to penetrate deeply.



Seed-bed with centre bearer for canvas shade.

There is generally alleged to be some uncertainty in propagating the plant from seed, and trials made with seed on the Farm at Wollongbar have not been satisfactory in results so far.

The seed should be sown in beds about 3 feet wide, with temporary side-bearers, for shades to be placed over the bed and so prevent the young seedlings being sun-scorched when they come up.

The canvas shade covering should be removed at night. Preparatory to sowing, the bed should be watered; then the seed should be mixed with very fine-sifted dry soil, and the mixture of seed and soil sprinkled over the dampened surface of the seed-bed. When sufficiently strong the seedlings should be transplanted into 1-foot rows—1 foot apart in the rows.

The plant can also be raised from cuttings of the stems of the spring crop. Only well-ripened stems should be used, cutting into short lengths of three eyes or buds that portion of ripened stem that has turned brown from near

RAMIE AT WOLLONGBAR FARM.

the root upwards. If this class of cutting is put out in the open, where shade cannot be provided, then the work must be done during moist cloudy weather. The surest and most satisfactory means of raising the plant is by root cuttings, taken from the roots of plants that have been established two or three seasons. A careful examination of the roots will discover portions bearing a number of so-called eyes. These are separated from the thick mass of fibrous matter and rubbish, and cut into pieces bearing five or six eyes, and are planted 5 or 6 inches deep in the rows. In favourable localities these cuttings will soon send forth fresh green shoots. Cuttings planted in this way in March showed they had started growth in eight days from planting.

When these cuttings have rooted and thrown up new growth to about a foot in height, the whole may be cut down as a waste crop, the foliage and stems being left between the rows to rot down as manure. This operation should not be performed while there is any likelihood of frost. In favourable weather a new and stronger growth will rapidly make way towards the future first crop.

The canes or stems are fit to harvest when the base of the stem is showing a change from green to brown colour, and another mode of finding whether the stem is ready for cutting is to pass the hand down the stem from top to bottom; if the leaves break off crisply it is ready to harvest.

The stems should be about 4 feet high when fit to cut, and they should be cut before the plant flowers. In situations free from frost four or even five cuttings may be obtained in a year. When cutting, the stems should be topped *i.e.*, the soft point taken off. They are then ready to pass into the Faure machine for decortication.

Monsieur Ch. Rivière, Chief of the Government Gardens of Algiers, says, for treatment in a green state, the correct time for cutting the stems is marked by the following characteristics:

1. The stem will have attained its maximum height, which should be from 5 ft. to 5 ft. 6 in.
2. One verifies that the bud or twig at the top will not grow any more.
3. Side shoots or twigs have a tendency to form in the "axilla" of the leaves in the upper portion of the stem. It is best not to wait their appearance.
4. The stem is no longer soft, less herbaceous, watery; and the "cortical thong" *i.e.*, outside rind or bark—is found out to be sufficiently strong; in other words, in hot and humid countries a stem, after about forty days growth, is sufficiently developed for treatment in a green state.
5. The harvesting of the stems can be done by hand in countries where labour is abundant and cheap. It can also be done with a mechanical reaper of special build. On a well-ordered plantation the development of the stems should be equal; consequently the harvest should be general, and gathered as quickly as possible to assure the regularity of the subsequent vegetation.

After thirty years' experience of Ramie, M. Rivière states that in forming any estimate as to the yield per acre it is necessary to recognise that the weight of green stems bears no relation to the amount of fibre obtainable, as if the season has been rainy the crops will weigh more than is the case in a drier period, although the actual yield of marketable fibre may be the same. The only reliable basis upon which an estimate can be framed is on that of the number of stems obtainable per acre per crop, and the height of the same, which should not exceed 1 metre 65 centimetres. He adds that about 500,000 stems can be obtained per hectare per crop *i.e.*, 200,000 per acre; also that stems of 1 metre 65 centimetres (5 feet), irrespective of weight, should contain 4 grammes of fibre. This is equal to a yield of (800 kilos) four-fifths of a ton of marketable fibre per acre per crop: and as they obtain in Algiers four crops the yield will be 3,200 kilos, or $3\frac{1}{5}$ tons per annum. In more tropical countries, Monsieur Rivière says that from six to eight crops will be obtained per annum, yielding respectively 4,800 kilos, or $4\frac{4}{5}$ tons, and 6,400 kilos, or $6\frac{2}{5}$ tons. For reference we will letter them A, B, C, so that we get the following table of the yields per acre per annum:—

A. Four crops of 200,000 stems, each yielding $3\frac{1}{5}$ tons of cleaned fibre.
B. Six .. ,, ,, $4\frac{4}{5}$ .. ,,
C. Eight ,, ,, ,, $6\frac{2}{5}$ .. ,,

Probably five crops would be the maximum ever attained on the Richmond and Tweed—four crops the average.

The material may be marketed as ribbons, which means strips of the bark prepared in a certain way: or as a fibre made from the ribbons, or direct from the green stem: or as filasse, which is a stage further on, where, through a chemical process, the ribbon or fibre is brought to a fine silky-white wool material.

To strip and prepare ribbons the fresh stems are steeped for a short period in boiling water in a tank 6 ft. x 3 ft. x 5 ft.: about 2 lb. of crude soda is added to the water. Green stems are thrown into this tank and steeped for about fifteen minutes: at the end of that time they are hooked out, and stripped of the bark either by hand or machinery. These strips (ribbons) are then passed through wooden rollers to squeeze out the superabundant moisture, and are then hung up to dry in the sun. After being very thoroughly dried, the ribbons are packed all the one way—*i.e.*, longitudinally, in bales about 5 cwt. in weight. Great care has to be taken to keep the material clean when in a wet state, and it must never be heaped, but hung in strands right away; if heaped, fermentation is set up and the fibre is deteriorated, if not destroyed.

The Faure machine now at the Wollongbar Experimental Farm does not make ribbons: it treats the green stems, producing fibre right away, which has to be degummed, then dried and packed for shipment. Ribbon is worth about £12 per ton; fibre from £20 to £35 per ton according to quality, and if further treated as filasse, up to £45 per ton.

Many inquiries are made by settlers in the Tweed and Richmond districts regarding the advisability of planting Ramie, and the prospects of disposing

of the green crops if they grow it; and in reply it may be said that it must always be borne in mind that should it unexpectedly turn out advisable to put areas under Ramie it cannot be done in a day, nor could the Department supply all the necessary roots and cuttings at one time; therefore persons putting in only one or two roots or cuttings at the present time will be forming the nucleus of a small nursery-bed of their own to fall back upon. A few plants put out in this way are not likely to be an encumbrance; they will soon be sufficiently well grown and vigorous to lift out of the ground, divide up, make cuttings, and replant, and so gradually extend the little nursery area until there will be sufficient plants to provide the material to plant out an acre or two should it in due course be shown that colonial enterprise will start a Ramie Fibre Company, and the product become sufficiently profitable to be a welcome adjunct to the other operations of the farm.

Is "Silky Heads" a Nutritious Fodder Plant?

J. H. MAIDEN.

A little while ago the Under Secretary for Agriculture of Western Australia was good enough to send me the following analysis of *Ptilotus alopecuroides*, F.v.M., local aboriginal name, "Mulla Mulla"; analysed May, 1907.

		Calculated upon 75 per cent. water basis.
Moisture...	6·99	75·00
Ether Extract	·62	·17
Albuminoids	13·65	3·67
Fibre	39·84	10·71
Ash	9·55	2·57
Nitrogen, Free Extract (carbohydrates)	29·35	7·88
	100·00	100·00

It is a common plant in the dry districts all over Australia; it is a native of all the Australian States except Tasmania. It belongs to the Amaranth family. The only record we have of the fodder-value of this species is unfavourable.

Mr. J. Connelly (June, 1906), bringing this plant from his Grawin Station, New South Wales, reported to me, "This plant has never been previously noticed on Grawin, but appeared in 1906 in such masses that it covered 7,000 acres, and all sheep had to be taken off the land. Sheep do not eat it, and it excluded all other herbaceous vegetation." I am aware that some allied plants are reported as good fodders. On what evidence?

The analysis of the Western Australian plant shows it in a more favourable light. Will pastoralists, and others, give their experience of this plant? Do sheep eat it? If so, when and where? Is it nutritious, or is it simply licked up with other herbage? Will correspondents kindly send a plant in flower, pulled up by the roots, with their observations?

Construction of Cattle Dips.

PERCY COWLEY,
Border Supervising Inspector of Stock.

Some general information in connection with the construction of Dips built of concrete, or of brick and concrete, in connection with attached specifications.

In concrete Dips the following are approximate quantities, and prices of material to be used :—

Gravel and sand mixed, about 22 yards, at 7s.
Sand, about 1 yard, 7s.
Cement, about 80 bags, at 5s.
Curved corrugated iron for roof, 21 sheets, at 3s.
Tank, square 400-gallon ship's tank, about 35s.
Piping, 1¼-inch, with taps and fittings, and attached, at about 1s. per foot.

In brick and concrete Dips the following are the approximate quantities and prices of the principal material used :—

Bricks, about 6,500, prices varying at from £2 to £3 per thousand.
Cement, about 50 bags, at 5s.
Sand, about 7 yards, at 7s.
Gravel, about 9 yards, at 7s.
Curved corrugated iron for roof, 21 sheets, at about 3s.
Tank, square 400-gallon ship's tank, about 35s.
Pump, semi-rotary No. 3, about £2 13s.
Piping, 1¼-inch, with taps and fittings attached, at about 1s. per foot.

The above are about average prices, subject to variation according to locality.

The depth of the excavation for Dip, and the amount of forming under the concreted floor of the Draining Yards and Crush, will depend on the nature of the land selected for Dip site.

Specification for the construction of a Concrete Cattle Dip, with Draining Yards and two Panels of Crush.

General.—Dip, settling tank, drain, floor of draining yards, and floor of two panels of crush, to be of concrete; Dip to be roofed with corrugated iron.

Excavation.—The excavation to be carefully taken out as near as possible to the following dimensions:—Length on top, 40 ft. 9 in.; width on top, 5 feet; length on bottom, 16 ft. 2 in.; width on bottom, 4 ft. 6 in.; depth, 7 ft. 9 in.; batter of footway, 1 in $3\frac{1}{2}$; the lower end of footway to be curved from the bottom to meet the batter.

Dimensions.—Dip to be the following dimensions, inside measurement, when complete:—Length on top, 40 feet; width on top, 3 ft. 6 in.; length on bottom, 14 ft. 6 in.; width on bottom, 2 ft. 2 in.; depth, 8 feet.

Construction.—Each wall to be put in without being jointed, the concrete to be gauged at 6 parts of clean gravel to 1 part of approved cement, to be mixed on a boarded platform, to be turned twice dry and twice wet, and to be put in as quickly as possible and well rammed; thickness of wall at bottom 13 inches, at top 9 inches; bottom and footway of exit to be of concrete 6 inches thick, well rammed; steps to be worked on face of exit for foothold, 9 inches apart, $1\frac{1}{2}$ inches high; the walls to be faced with a composition of two parts of cement to three parts of sand, $\frac{3}{4}$-inch thick, to be properly trowelled smooth on face; the bottom and footway to be also faced in same manner.

Draining Yards.—To be two yards, each 18 ft. x 9 ft., and built to the design shown on plan, to be fenced by a four-rail fence, posts of approved hardwood to be 9 feet long, not less than 1 foot in diameter at the small end, to be sunk 3 feet in the ground and well rammed; rails to be of saplings not less than 4 inches in diameter at the small end, to be of approved hardwood, to be fitted into scarf on inside of posts, and ends properly butted together in the centre of posts, to be securely wired on to posts with two strands of No. 10 iron wire.

Floors.—Floor to be concreted.

A curbing of logs to be firmly fitted and embedded on the ground between the posts round the yards before the concrete is laid down; both yards to be covered with concrete 5 inches thick, properly laid and rammed. The concrete to be mixed in the proportion and manner before stated, the surface of the floor to be left rough for foothold, with facing mixed in proportion of two of cement to three of sand, to be floated on, and to slope sufficiently towards drain leading to settling tank to carry the fluid into tank, and an opening to be left in curbing close to drain to carry off the flood water.

Settling Tank.—To be of concrete 5 inches thick, faced with cement same as Dip, connected with floor of draining yards by a 9-inch cement drain about 4 feet long, ledge about $\frac{1}{2}$-inch wide to be left inside of tank above plug-hole to carry strainer; dimensions, 2 ft. x 2 ft. 6 in. and 2 ft. 6 in. deep, inside measurement.

Draining Yard Gates.—To be three in number, placed in position shown on plan, the centre gate to be 5 ft. 6 in. long, the other two to be 8 ft. 3 in. long each, to be hung on strong iron hinges, the top hinge to be bolted through post; gate to close into scarf in post and to be fastened

with an iron peg of 1-inch round iron, to be of four rails 4 in. x $1\frac{1}{2}$ in., with 4 in. x $1\frac{1}{2}$ in. brace, rails mortised into stile and heads; stile 4 in. x 3 in., head 3 in. x 3 in., bolted throughout; timber of approved hardwood.

Crush.—To be two panels long, each 9 feet, leading into Dip; posts to be 9 feet long, sunk 3 feet in ground and well rammed, to be not less than 1 foot in diameter at small end; the four posts at the sliding gate to be 10 feet long, to allow for fall into Dip, sunk 3 feet in ground and well rammed; fence to be four rails of approved hardwood saplings, not less than 4 inches in diameter at small end; to be let into scarf inside of posts, and butted in centre of posts and securely wired with two strands of No. 10 iron wire.

Width of crush to be 2 feet between the posts at ground, and 3 feet at top; the side of entrance panel to be 2 ft. 6 in. between the rails top and bottom, and the rails to extend over Dip 3 ft. 6 in., and faced level and boarded with inch boards; the sides of the entrance panel to slope up under bottom rail back to first post on each side, to be built up of concrete 9 inches wide, and faced same as Dip; the bottom of entrance to be 2 ft. 6 in. wide, to be concreted 6 inches thick, and covered with a facing $\frac{3}{4}$-inch thick, floated on, mixed in the proportion of two of cement to three of sand; to be built with a fall as shown on plan, from the first post to edge of Dip (or take-off), which is 18 inches below top of Dip wall, the last 4 feet of the bottom to be laid in steps for foothold 8 inches wide and $1\frac{1}{2}$ inches high.

Sliding Gate in Crush.—To be erected to run between the four crush posts at back of entrance panel, to be hung on double iron hinges to run on 1-inch thick iron rod or $1\frac{1}{4}$-inch galvanized piping, with cross beam and top beam of 5 in. x 5 in. hardwood, spiked to top of posts; rod to be supported by ring-bolt (near the middle) from top beam; gate to be 3 ft. 3 in. wide; four 6 in. x 1 in. rails, mortised into 3 in. x 3 in. heads, with 6 in. x 1 in. brace, bolted throughout, and of approved hardwood.

Roof over Dip.—To be of 8-foot curved corrugated iron, with 1-foot rise, securely nailed to plates of 4 in. x 3 in. sawn hardwood, and bolted together with two bolts to each lap; plates to be securely fastened to top of roof posts.

Posts to carry roof to be of approved hardwood, 9 inches in diameter, to be sunk close to outside walls but not touching same, to be scarfed to stand over top of wall about 3 inches, to be 2 ft. 6 in. in ground, and well rammed; two 4 in. x 2 in. hardwood sawn rails to be run through on inside of posts, the first two panels from entrance to be boarded (about 20 feet) 3 feet high with $\frac{3}{4}$-inch hardwood T. and G. boards, fitted close to top of Dip wall, the last panel at exit to have extra rail on each side of the same material and placed above the two already specified, and manhole to be left at exit where shown on plan.

Tank, Piping, &c.—A sound 400-gallon square iron tank to be supplied and to be placed where directed, and set up level on two hardwood logs, the tops of which have been faced and logs bedded firmly in ground; also No. 3 semi-rotary pump with necessary length of 1¼-inch piping, with valve, to be properly fitted up and connected with water supply; also about 4 feet of 1½ inch piping and tap fitted to tank to connect with Dip.

Notes.—1. Only approved material to be used. 2. All material to be supplied by contractor. 3. Tenderer to state time required to complete work. 4. Tenders will close , 1907, and must be addressed to . 5. The lowest nor any tender not necessarily accepted.

Specification for Cattle Dip, to be constructed of Brick, Concrete, and Cement, with Draining Yards and two Panels of Crush.

Locality.

General.—Walls of Dip to be of brick, and the bottom and the footway to be of concrete.

Excavation.—The earth to be excavated to the following dimensions; walls to be carefully sloped, length on top 41 feet, width on top 5 ft. 10 in., depth 7 ft. 8 in., length of bottom 16 ft. 2 in., width of bottom 4 ft. 4 in., the batter of footway to be 1 in 3½, lower end of footway to curve to end of bottom.

Construction.—Foundations of walls to be two courses of bricks 18 inches wide, firmly laid on bottom with cement mortar, to be set back 2 inches on either side of wall.

Wall.—To be built of brick properly laid with cement mortar; wall to be 14 inches wide, to be carried to the top of the water line (6 ft. 6 in.), and from that to the top of wall, making 8 feet clear deep, the walls to be 9-inch work, all bricks to be thoroughly wet before set, each course to be well grouted, a buttress on the outside of each wall 7 feet from entrance, to be built properly in with the wall, 18 inches thick and 9 inches out from wall at bottom and dying into wall at water-line. Walls to be faced with composition of 2 of cement to 3 of sand, properly mixed and applied.

Mortar.—The cement mortar for all brickwork to be mixed in the proportion of 1 of cement to 3 of clean sand, mixed together on a boarded platform, to be turned twice dry and twice wet.

Dimensions of Dip.—The Dip to be the following dimensions, inside measurements, when finished: length on top to be 40 feet, width on top 3 ft. 6 in., length on bottom 14 ft. 6 in., width on bottom 2 ft. 2 in.

Bottom and Footway of Exit.—The bottom and footway of exit to be of concrete properly laid down and rammed, to be 6 inches thick, to be mixed in a proportion of 1 of cement to 6 of clean gravel, to be faced with cement same as walls, and steps for foothold 1½ inches high, 9 inches apart, to be worked in on face of footway of exit, batter of footway to be 1 in 3½.

Roof over Dip.—To be of 8-foot curved corrugated iron, with 1-foot rise, securely nailed to plates of 4 in. x 3 in. sawn hardwood, and bolted with two bolts to each lap; plates to be securely fastened to tops of roof posts.

Posts to carry roof to be of approved hardwood 9-inch in diameter, to be sunk close to outside walls but not touching same; to be scarfed to stand over top of wall about 2 inches; to be 2 ft. 6 in. in ground and well rammed; two 4 in. x 2 in. hardwood sawn rails to be run through on inside of posts, the first two panels from entrance about 20 feet; to be boarded 3 feet high, with 6 in. x ¾ in. hardwood T. and G. boards, fitted close to top of Dip walls; the last panel at exit to have an extra rail on each side of the same material and placed above the two already specified, and manholes to be left where shown on plan.

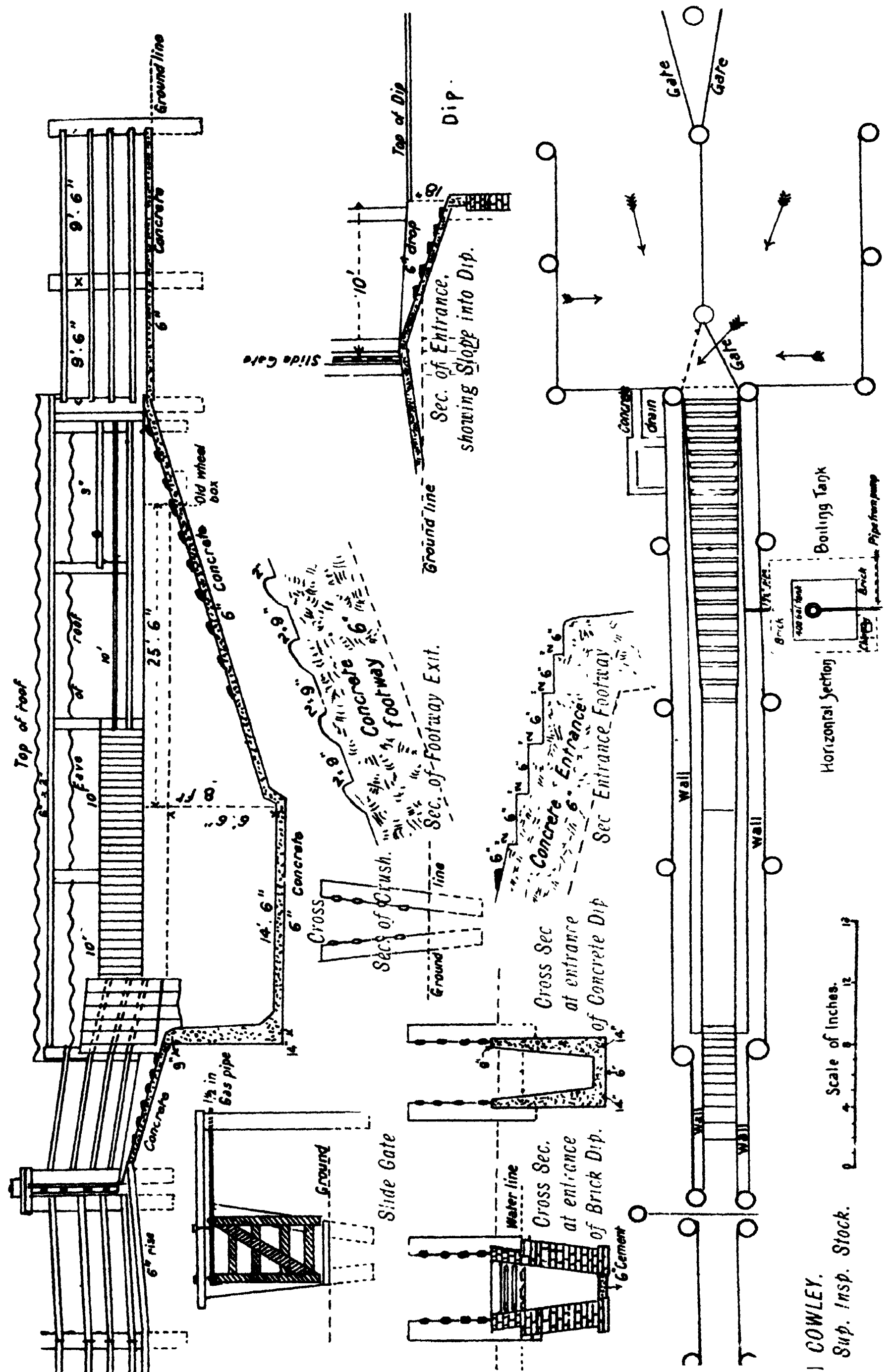
Draining Yards.—Draining yards to be two in number, each 18 ft. x 9 ft., built to the design shown on plan; to be fenced with four-rail fence, posts of approved hardwood, to be 9 feet long, not less than 1 foot in diameter at small end; to be sunk 3 feet in the ground and to be well rammed; rails to be of saplings not less than 4 inches in diameter at small end; to be of approved hardwood; to be fitted into scarf on inside of posts, and ends properly butted together in the centre of the posts and securely wired on to posts with two strands of No. 10 iron wire.

Floor of Draining Yards.—A curbing of logs to be firmly fitted and embedded on the ground between the posts round the yards, surface of ground to be made smooth and firm before the concrete is laid down, both yards to be covered with concrete 5 inches thick, properly laid and rammed, to be properly mixed in the proportion of 1 of cement to 6 of clean gravel, turned twice dry and twice wet on a boarded platform, the surface of the floor to be left rough for foothold, and to slope sufficiently to carry the fluid into the drain leading to the settling tank; an opening to be left in the curbing close to drain to carry off flood-water.

Settling Tank.—To be built of brick laid together with cement mortar and faced with ¾-inch cement same as Dip, to be connected with floor of draining yards by 9-inch cement drain 4 feet long, ½-inch ledge to be left round inside to carry strainer; dimensions, 2 ft. x 2 ft. 6 in. x 2 ft. 6 in. deep inside measurement.

Draining Yard Gates.—To be three in number, placed in a position shown on plan, the centre gate to be 5 ft. 6 in. long, the other two to be 8 ft. 3 in. each; to be hung on strong iron hinges, the top one to be bolted through posts, to close into scarf in post, and each gate to be fastened with an 8-inch iron peg of 1-inch round iron; to be four rails 4 in. x 1½ in., with 4 in. x 1½ in. brace, rails to be mortised into stile and head; stile of 4 in. x 3 in.; head, 3 in. x 3 in., bolted throughout.

Crush.—To be two panels long, each panel 9 feet, leading into Dip; posts to be 9 feet long, sunk 3 feet in the ground and well rammed; to



Sketch Plan of Dip

PERCI COWLEY.
Sup. Insp. Stock.

be not less than 1 foot in diameter at small end; the four posts at the sliding gate to be 10 feet long to give fall into Dip, sunk 3 feet in the ground; fence to be four-rail, of saplings not less than 4 inches at small end, to be scarfed into posts on inside and butted together in centre of posts; the rails of entrance panels to extend over Dip 3 ft. 6 in., and faced level and boarded with inch boards, the rails to be securely fastened with two strands of No. 10 iron wire; width of crush to be 2 ft. 2 in. at ground between posts, and 3 feet at top; the sides of entrance panel to be sloped up under bottom rail back to first post on each side; to be built of brick 9 inches wide and faced same as Dip; the bottom of entrance to be 2 ft. 6 in. wide, to be concreted 6-inch thick, and covered with a ¾-inch facing, floated and mixed in the proportion of 2 of cement to 3 of sand; to be built with a fall as shown on plan from the first post to the edge of Dip (or take off) which is 18 inches below top of Dip wall, the last 4 feet of the bottom to be laid in steps for foothold, 8 inches wide and 1½ inches high.

Sliding Gate in Crush.—To be erected to run between the four crush posts at back of the entrance panel: to be hung on double iron hinges to run on 1-inch thick iron rod (or 1¼-inch galvanised piping), with cross beam and top beam of 5 in. x 5 in. hardwood, spiked to top of posts, rod to be supported near the middle by ring-bolt from top beam; gate to be 3 ft. 3 in. wide, four 6 in. x 1 in. rails, mortised into 3 in. x 3 in. heads, with 6 in. x 1 in. brace, bolted throughout, and of approved hardwood.

Tank, Piping, &c.—A sound 400-gallon square iron tank to be supplied, to be placed where directed, and set up level on two hardwood logs, the tops of which have been faced, and bedded firmly in ground, also No. 3 semi-rotary pump with necessary length of 1¼-inch piping, with valve, to be properly fitted up and connected with water supply; also about 4 feet of 1½-inch piping and tap, fitted to tank to connect tank with Dip.

Notes.—1. Only approved material to be used. 2. All material to be supplied by contractor. 3. Tenderer to state time required to complete work. 4. Tenders will close , 1907, and must be addressed to . 5. The lowest nor any tender not necessarily accepted.

Fishes as Mosquito Destroyers in New South Wales.

DAVID G. STEAD,
Naturalist to the Board of Fisheries for New South Wales.

EACH year, with the ushering in of the warm weather, the much-discussed "mosquito problem" comes prominently forward, and many and ingenious are the suggested remedies for the purpose of keeping down this acknowledged curse. Amongst the various ideas that have been brought forward recently, one that has found much favour with many people, has been that of introducing small fishes into mosquito-infested waters for the purpose of preying upon the mosquitoes. The eradication of the mosquito is of such vast importance to the community at large that it is not surprising that such an attractive looking and apparently simple "cure" should have been so favourably received. Considerable impetus has been given to the subject of late through the publication of various articles in the daily Press, and as the mosquitoes will soon be with us, we may expect to hear more anon. I have often been asked to state what part our small fishes played, or what part they might be made to play, in keeping down the numbers of this fearful pest; and the question was put to me the other day by one of the municipal representatives of a portion of "Greater Sydney." This gentleman wished to know whether I considered that, if small fishes were introduced into the various ponds and creeks, they would be the means of removing the mosquito-curse from the locality which he represents.

My views upon this matter are, briefly, as follow:—

In the first place, there is not the slightest doubt that most small pond fishes are an important factor in controlling to *some extent* the supply of mosquitoes as well as of other insects which possess aquatic larvæ, as they prey upon them greedily whenever opportunity offers.

Amongst our own indigenous fishes, no more inveterate enemies are to be found than the various species of Minnows (*Galaxias*) which are plentifully distributed throughout the eastern division of New South Wales. These are all highly active, agile surface-swimming fishes, always on the go, and always ready for food; and they are to be found in great profusion in every creek and almost every natural pond, even though the latter be of very small size. In addition, they are to be seen in very many permanent artificial ponds, such as are to be found in brickyards.

In ponds where the Minnows do not occur, their place is occupied by that ubiquitous introduced pest, the common Goldfish or Silverfish (*Carassius auratus*) which, if not as active as the Minnow, is just as hungry for mosquito larvæ.

Yet, notwithstanding all this, we know, only too well, how the mosquitoes flourish. And the reason is not far to seek. However voracious the fishes mentioned may be, or however ceaseless they may be in pursuit of their tiny quarry, they are severely handicapped and their "sphere of influence" is greatly curtailed, by the fact that, *mosquitoes can, and do breed in every tiny pot-hole or temporary pond,* either close to creeks or on the higher levels after rain. Even along the margin of creeks or ponds are often to be seen numerous small depressions caused, perhaps, by the hoofs of horses and cows, or by the removal of wood or stones. In all of these localities the mosquitoes breed unhindered and the amount so produced, although usually overlooked or considered as unimportant, is really incalculable.

(I here take no account of another important aspect of the problem, and that is, the large quantities of mosquitoes which are produced in open tanks, wells, barrels, or even buckets of water in the vicinity of houses.)

Another favourite place of breeding is the still, "dead" water, along the usually gently-shelving margins of ponds or even running streams, where a dense growth of plant-life prevents either wholly or in part the access of fishes.

In the main open portions of ponds or creeks which are fairly well stocked with fish-life, the larval mosquito has but a poor chance; but even here (and more particularly towards the end of the season) the amount of larvæ generated may be altogether in excess of the consuming power of the fish population (it has to be remembered that this is not their *only* food).

From what I have said, then, it will be quite clear that under certain conditions our fishes are a highly important factor in keeping down the mosquitoes. In other words, that, providing no other unforeseen agency were brought to bear, if we had no fishes in our creeks and ponds, the mosquitoes would be enormously in excess of their present plague numbers.

Reasoning from this, it will be seen that the introduction of small fishes of a carnivorous nature into *small private ponds, tanks, or aquaria* in large numbers might be of considerable use, particularly where they are in close juxtaposition to houses; but it is also apparent that the following out of this course, as far as temporary water-holes and ponds are concerned, would be altogether impracticable. Even in the first case, repeated introduction of fishes would be necessary to ensure an adequate supply.

As far as the treatment of open natural waters is concerned, I think there are too many natural obstacles in the way to allow of fishes—either indigenous or introduced, and however they multiplied—effectively cleaning out the larvæ of mosquitoes, unless the impossible condition arose, that the latter were the only food obtainable; in which case, of course, the fishes themselves would die of starvation; the goal might be *almost* reached if very large numbers of the fishes were planted at frequent intervals. This, however, would be impracticable.

The mosquito problem is a most important one, and one that will have to be faced sooner or later. The extent to which the mosquito is capable of acting as a transmitter of pathogenic micro-organisms is just beginning to be understood.

Treating waterholes with kerosene is of use in many instances, while introduction of fish-life will also be of slight benefit, but the true "cure" will never come until a mighty crusade is undertaken by the people in general. To a great extent this will have to take the form of filling up ditches and of draining marshes in the vicinity of human habitations, just as is being done at the present time, with such splendid results, in parts of tropical America.

NOTE ON RHODES GRASS.

[See *Gazette* for December, 1906, page 1206.]

J. H. MAIDEN.

MR. SYLVESTER BROWNE, of "Minembah," Whittingham, near Singleton, the introducer of Rhodes Grass into this country, has brought me two plants grown from seed I sent him, received by me from South Africa, viz.:—

(*a*) *Chloris Gayana.*—This is the grass figured at pages 1206, 1211, and plate 437.

(*b*) *Chloris virgata.*—This is the grass figured at plate 436.

Now (*a*) is a stronger grass than (*b*). The flower-spikes of (*b*) are silkier, smaller, and paler than those of (*a*); (*b*) is really a pale grass, while (*a*) is rather a dark one when dry; (*a*) is much more vigorous than (*b*), and overruns it if it gets a chance.

Now let us deal with the grasses separately. Mr. Browne's experience is:—

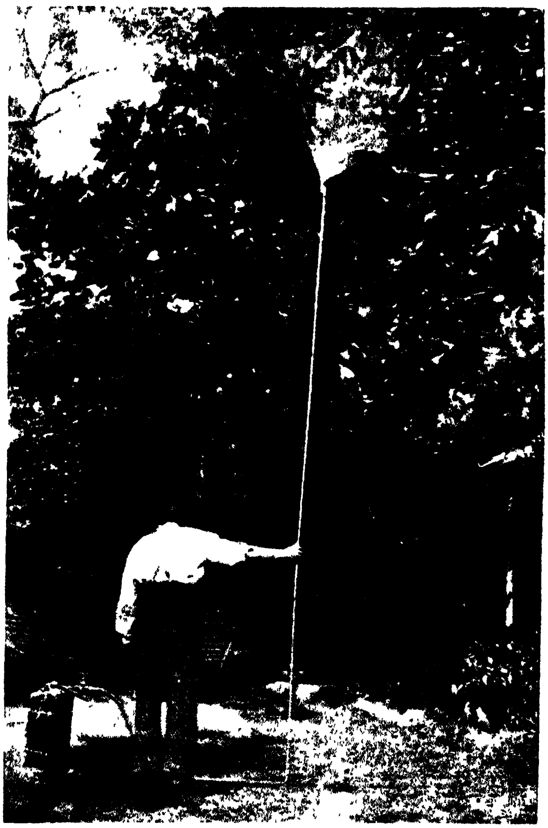
(*a*).—This is planted 5 feet apart. As soon as it starts it commences to "flow" all over the ground forming long creepers, say, 8 feet long, each plant thus forming a patch, say, 16 feet in diameter. Each trailer or creeper roots at every 3 inches. When it has done running, the whole mass grows up to 6 feet high with irrigation, and 3 feet and more under average natural conditions. It was originally placed in cultivated land, which should be done in all cases in order to give new grasses a fair chance. It should always be enclosed and eaten down under control; if planted in the open, in isolated plants, stock keep it so thoroughly cropped that it is at a disadvantage with its natural enemies—the other grasses. That hay made from it is very aromatic, and is greatly relished by all stock, and seems to improve with age.

(*b*).—Grows more in tussocks and smaller than (*a*), and is not so stoloniferous, that is to say, it does not run so much. It is apparently a good sweet fodder grass.

I have no hesitation that both grasses are valuable additions to the grass wealth of the State, and now I have carefully indicated the differences between them, it will be found that they supplement each other, and they should be tested separately.

The Tyree Spraying Machine.

Orchardists and others who have had experience of spray pumps know how arduous becomes the necessary pumping to maintain a fine and effective spray. To these the Tyree Spraying Machine, which is automatic, will immediately appeal. The pressure necessary to force the solution through the nozzle is obtained in a very simple manner by generating acetylene gas within the cylinder until a pressure of 100 lb. or more to the square inch is obtained. There are no wearing parts—no pistons, no valves. It is portable, and requires only one person to operate it.



Tyree Spraying Machine at work.

The following letters, received from users, will show the varied work performed satisfactorily:—

Mr. F. C. McIntosh, Telegraph-road, Pymble, writes:—"I have given the spray a thorough trial. I find it works A1 with soda wash, resin wash, and kerosene emulsion. I consider it the best spraying machine on the market. I can spray a large orange tree with it thoroughly in five minutes. I did an ordinary sized tree with lime-wash in four minutes. There is not the slightest doubt that the spraying machine is just what orchardists require."

The manager of the State Experimental Farm, Grafton, writes:—"I have the honor to inform you that I have used your spraying machine on cattle, and found it most successful, as it penetrates right to the skin."

Mr. A. Schwebel, Glenorie, writes:—"I have given the spray a good trial with lime. I have limed all the butts of my trees, and it has done good work."

Prince Alfred Hospital write:—"I beg to state that the spray has given satisfaction."

Mr. J. A. Mackenzie, Springvale, Kewai, Victoria, writes:—"I have used your spray with paint and lime, and it has done the work splendidly. I white-washed cow-sheds, and sprayed trees with it in a very short time."

Mr. Marshall, Wetherill Park, Smithfield, writes:—"The spray has given every satisfaction. I have used it for spraying vines with Bordeaux mixture."

Mr. Robbie, Superintendent of Public Parks, writes:—"Your automatic spray answers all the requirements necessary for my work, spraying shrubs and trees for the various diseases to which they are liable."

At a demonstration given to the Public Works Department, thick white-wash was put on a rough wall at the rate of 25 yards in 4½ minutes.

The Stock Branch are using the machine in connection with spraying for ticks on cattle in the north, with every satisfaction.

The uses to which the machine may be put are innumerable. At present, demonstrations are being conducted before the various municipalities, showing the spraying of tar for roads and footpaths, &c.

The machine is made of galvanized steel, and is lined with various materials for special purposes, such as acids and chemicals.

It is manufactured in Sydney by Tyree, Limited, 314, George-street, from whom prices and further particulars may be obtained

Shorthorn Bull, "Belisarius."

M. A. O'CALLAGHAN.

THE photograph of the imported Shorthorn bull, "Belisarius," given herewith, illustrates the champion bull in the Milking Shorthorn Class at the last Sydney Royal Show. He was imported about a year ago by the Camden Park Estate, of which Major Onslow Thompson is manager, and to whom I am indebted for his pedigree and particulars.

This bull was bred by the Right Hon. F. J. S. Foljambe, Osberton, Worksop, and is reputed to have come from a very old milking strain, as the following copy of certificate by one of the judges at the English Royal Show goes to prove:—

> I have no hesitation in saying that Belladonna, her sister Bella, and their dam Beauty, are among the best cows in England at the present day, and have twice won the family prize at the great Yorkshire Show. They are excellent dairy cows, and show the true character of high-class Shorthorns.

Like all pure-bred pedigreed Shorthorn bulls, "Belisarius" looks a bit on the beefy side to satisfy the average dairyman; but, as I have frequently said, with bulls of this character, you cannot judge them very well on their appearance, as they have been well fed from a flesh-producing point of view from their calfhood, and, therefore, one cannot expect the fine lines noticeable in bulls raised in Australia chiefly on grass food. The true test, and, in fact, the only reliable test, of these animals is their progeny, and this very handsome bull should throw some very good-looking stock if well mated.

"Belisarius," red and little white; calved 3rd March, 1904. Bred by Right Hon. F. J. S. Foljambe, Osberton, Worksop. The property of Camden Park Estate, Limited.

	Got by	Haycroft (79041).
Dam Belladonna ..	,,	Leonidas (59260).
g.d. Beauty ...	,,	Duke of Charming Land 46th (54190).
gr. g.d. Bertha 15th ..	,,	Earl of Fawsley 3rd (28506).
gr. gr. g.d. Bertha 5th..	,,	Duke of Hazlecote 48th (39742).
gr. gr. gr. g.d. Bertha ...	,,	Conqueror (21466).
gr. gr. gr. gr. g.d. Anemone 2nd	,,	Duke of Cambridge (12742).
gr. gr. gr. gr. gr. g.d. Anemone ...	,,	Allan-a-Dale (7778).
gr. gr. gr. gr. gr. gr. g.d. Ultima	,,	Little John (4232).
gr. gr. gr. gr. gr. gr. gr. g.d. Beatrice ...	,,	Caliph (1774).
gr. gr. gr. gr. gr. gr. gr. gr. g.d. Sir Charles Rightley's Quickly.	,,	Swing (2721).
———	,,	Argus (759).
———	,,	Defender (194).
———	,,	Petrarch (488).
———	,,	——— (104), own brother to Colling's heifer Butterfly.
———	,,	Globe (278).

SHORTHORN BULL, "BELISARIUS."
The property of the Camden Park Estate, Limited.

Seasonable Notes.

GEO. L. SUTTON,
Wheat Experimentalist.

As the result of inquiries made from Mr. W. Corp, the gentleman who milled the "Bobs" flour referred to last month, it is now learnt that "it was produced from wheat which had suffered slightly from exposure during harvesting operations, which fact would of course tend to improve the colour of the flour at the expense of its strength." The very satisfactory conclusion to be drawn from this information is, that had the flour been milled from a prime, unbleached, and therefore uninjured sample of "Bobs" the report of Mr. Humphries would have been even more satisfactory than it is. The statement "that whatever its ("Bobs") faults may be, they do not include those of inferior milling value," made by the late William Farrer, when comments regarding the inferior quality of "Bobs" first appeared is now confirmed and its truth emphasised; seeing that the milling quality of "Bobs" is so good (a fact now established beyond dispute by independent testimony) many farmers will be at a loss to understand the attitude of certain millers, none of whom were anxious to buy "Bobs," and some of whom even refused to purchase it.

The attitude of these millers is not altogether surprising, and must be regarded only as one of the many obstacles which have always to be encountered, when an effort is made to introduce something slightly different to what people are accustomed to. At one time similar hostility was displayed towards the Manitoba varieties, which are recognised as the standard of "strength" the world over, and in consequence of which are in demand at a premium on the price asked for other wheats. Some eighteen years ago Farrer submitted a sample of "Power's Fife," one of the very best Manitoba varieties, to a miller for an expression of opinion as to its milling quality. The opinion expressed was that "it is valueless for milling."

"Bobs," in common with other strong wheats, is harder, and more difficult to mill than the soft wheats in general cultivation, and until the need for producing "stronger" flour became a vital one, the average miller could see little advantage in purchasing, and none in paying a premium for, a wheat which though "stronger" was harder to mill and decreased his output. Now, however, the demand for "strong" flours is imperative and the very existence of some of our mills depends upon their ability to turn out a "stronger" flour than formerly. There is, therefore, likely to be increased inquiry for "Bobs" and similar high-grade wheats. In districts suited to it, *i.e.*, where it yields well, "Bobs" can now be regarded as a standard variety with a recognised value, and can be planted in the future with every confidence that a demand exists for it.

Inquiries are being received as to the probabilities of success with spring sown rape in the wheat districts. Last year several cases of extremely

satisfactory results with rape, sown at this season of the year, were reported, but despite these successes, spring planting cannot be confidently recommended. Except in cold districts, and in unusual seasons in warm ones, rape sown now is not likely to prove profitable. Though it will grow well, it is extremely liable to be attacked by the cabbage-aphis, which in all cases will reduce its feeding-value, and in some cases will entirely destroy the crop. Far more success and satisfaction is likely to be obtained by planting cowpeas, sorghum, millet, or maize, especially if these crops are planted on ground which has been fallowed during the winter. The millets are best sown broadcast, or drilled like wheat, but with the other crops the probability of failure is considerably lessened by planting them in drills and cultivating the ground between the drills during their growing season with the spring-tooth cultivator or similar implement.

The distance between the drills in which the seed is sown will be governed by the drill available to do the work; suitable distances for the rows to be are, for cowpeas and sorghums 2½ to 3 feet, and for maize 3½ to 4 feet apart. Of the crops mentioned cowpeas are the most suitable for grazing, and after being eaten down will grow again until killed by frost. The other crops are rather coarse for best results by grazing, but are amongst the very best for conserving in the succulent form as ensilage.

The varieties likely to give the greatest satisfaction in the wheat districts are: Cowpeas—Black; Sorghums—Early Amber-cane, and Black Sorghum; maize—Iowa Silver-mine, and Hickory King; millets—Hungarian, and White French.

Monthly Weather Report.

HAWKESBURY AGRICULTURAL COLLEGE, RICHMOND.

Summary for July, 1907.

Air Pressure (Barometer).			Shade Temperature.				Air Moisture Saturation = 100.			Evaporation (from Water Surface).			
Lowest.	Highest.	Mean.	Lowest.	Highest.	Mean.	Mean for 15 years.	Lowest.	Highest.	Mean.	Most in a Day.	Total for Month.	Monthly Mean for 9 years.	% of the year's Evaporation.
29·79 22	30·48 14	30·10	23·0 14	69 9 26	48·21	49·010	46 6	95 5	74·41	·140 7	1·901	1·891	4

Rainfall ... { Points 1½, 5; total, 6½. Mean rainfall for 15 years = 252 points.
Dates 6, 28.

Wind ...	N	NE	S	SW	W	NW
	3	6	2	6	3	17

Greatest daily range of temperature = 38° on 31st.

Days on which shade temperature fell below 42° = every day except 6, 19, 22.

The driest month experienced at the College. (Records commenced, 1893.) Frosts recorded on 16 days. NW—W winds almost daily throughout the month.

W. MERVYN CARNE,
Observer.

Weather during July, 1907.

A. NOBLE,
Officer-in Charge, Meteorological Department.

THE month opened with an active disturbance located over Tasmania, which had caused a fall of over half an inch in the barometer at Hobart in 48 hours, and high seas on the west coast and fierce squalls in the straits. On the 1st some light to heavy rains were recorded on the extreme north coast, and light to moderate over Riverina and western slopes as far north as Trangie. Light and scattered showers continued along S.W. slopes and in Riverina until the 5th, when pressure distribution over Australia showed considerable intensification, and by the 6th resulted in light to moderate rain over the Barwon tributaries, Riverina, western slopes and tablelands. On the 8th fine weather ruled generally over New South Wales, the central part of the high pressure being situated over our northern districts. During the following day a considerable fall in barometers took place in our southern areas and over Victoria, squally westerly winds and light showers in Riverina and on S.W. slopes resulting. By the 12th the weather throughout the whole continent was controlled by a high pressure centrally situated over South Australia, the succeeding three days being the coldest experienced this winter in New South Wales, the following being the lowest records during that period: Kiandra, 4° below zero; Inverell 15°, Nimitybelle 18°, Armidale 18°, Rockley 18°, Braidwood 19°, Carcoar 19°, Warialda 19°, Dubbo 20°, Molong 20°, Tenterfield 20°, Carinda 21°, Bingara 21°, Glen Innes 21°, Tabulam 21°, Queanbeyan 21°, and Walcha 21°. Fine weather continued until the 15th when rain started on the extreme north coast, and by the following day had extended over northern tableland and Barwon tributaries, the eastern part of western division and Riverina. The rain area gradually contracted until the 19th, when it had reached the seaboard. On the 20th light showers again started in the extreme S.W., and by the 23rd had extended over Riverina and thence along western slopes and tablelands as far north as Hill End. On the last mentioned date a new disturbance appeared off Cape Leeuwin, and on the 24th and 25th showed a considerable increase in energy. This disturbance, as it travelled eastward, resulted in good rains over West Australia and South Australia, and by the 29th had covered the whole of New South Wales and Victoria. Some good falls occurred in our State, reaching or exceeding one inch, the following being the heaviest: Kiandra 252 points, Coonabarabran 184 points, Tumberumba 148 points, Barmedman 138 points, Deniliquin 134 points, Trangie and Mudgee 112 points, and Gilgandra 127 points. Thence fine weather continued until the end of the month.

Rainfall over New South Wales during July, 1907.

The distribution of rainfall over the State as a whole for the month of July has been less favourable than during the preceding month. Only a few narrow strips situated along the Paroo to Wilcannia, over the Barwon tributaries, central-western plains, and near southern border, had fallen in excess of normal. Over the greater part of the State the rainfall was considerably below average, whilst the greatest defects were experienced over our coastal districts and approached 100 per cent. below normal. Some peculiar disparities are shown between amounts registered at neighbouring stations, especially over northern areas, probably the result of thunder. On the north Warrego, Barringun received 8 per cent. above normal, while Enngonia, 21 miles to south of it, received 61 per cent. below normal.

Taking the various subdivisions of the State, the distribution has been as follows:—

	Percentages. Above.		Below.
Over North Coast	—	...	72 to 95
,, Hunter and Manning	—	..	61 ,, 98
,, Metropolitan area .. .	—	. .	92 ,, 100
,, South Coast	—	.	63 ,, 100
,, Western Tableland .	—	..	24 ,, 83
,, Central Tableland	—	..	8 ,, 98
,, Southern Tableland	19	to	100
,, North-western Slope	13	,,	92
,, Central-western Slope ...	19	,,	43
,, South-western Slope	60	,,	74
,, North-western Plain ..	56	,,	58
,, Central-western Plain.. . .	94	,,	63
,, Riverina	48	,,	41
,, Western Division . .	70	,,	87

The following statement shows a brief comparison of the chief meteorological elements over India, together with Sydney (N.S.W.) for the month of July, 1907:—

	Departure from normal. Pressure.	Temperature.	General Conditions (referring to State as a whole).
	Inch.	Degrees.	
Simla (India) ...	-·01	+1·9	Monsoon weak, but improving.
Sydney (N.S.W.) ...	-·01	-0·1	Moderately dry.

Orchard Notes.

W. J. ALLEN.

SEPTEMBER.

Fruit Fly.—During the past few months the fruit fly controversy has waxed and waned alternately; but I am pleased to say that during an extended tour through our orange groves I could not find a fly in any of our orchards, nor could I find a grower who had seen one during the last month or more, and it is almost impossible to find a single specimen of diseased fruit among our oranges, lemons, and Emperor mandarins. The cold weather experienced in July must have wiped out of existence all the flies then remaining, and I trust that the attention which growers are devoting to picking up and destroying all fallen fruit will rid us of this pest, to a great extent, before long.

Spraying.—A good many growers have used the lime and sulphur spray this year, omitting the salt, and those who have done so claim that it is not so severe on the hands, and in every respect a much easier spray to handle. Some have added 2 to 3 lb. of bluestone to each 50 gallons, in addition to the 15 lb. each of lime and sulphur.

It is well to make early arrangements for the fighting of the codling moth, and while arsenite of soda has proved to be much superior to the Paris green for fighting this pest, it is now claimed by many in America that the arsenate of lead is even better than the arsenite of soda.

First Spraying.—Use 3 lb. of arsenate of lead to 50 gallons of water. The application should be given just as soon as most of the petals have fallen.

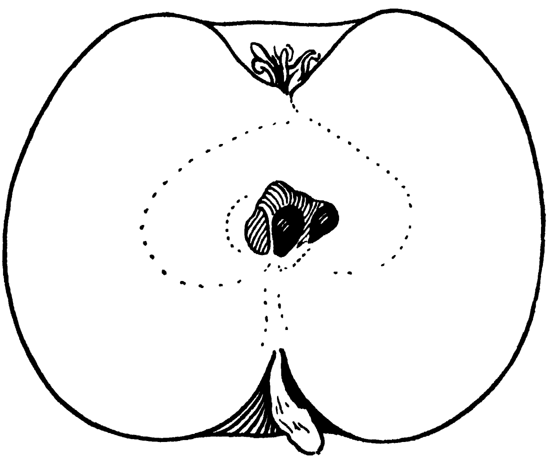
Second Spraying.—To follow about three weeks after the first, using 2 lb. of arsenate of lead to 50 gallons of water. Subsequent sprayings may be given at intervals of every four weeks if the moth is bad, using about 1½ lb. of arsenate of lead to 50 gallons of water. This spray is recommended by G. W. H. Valch (*California Fruit-grower*).

In spraying trees with this or any other spray, see that a good pressure is kept up, so that the pump will throw a good fine mist; and be particular to cover the inside and outside of the tree, as well as the whole of the fruit.

If the spring proves to be a wet one, it is advisable to spray any trees which have in previous wet years shown signs of fungus diseases—such as Peach curl on the peach-tree, Black spot or Scab of the apple, Black spot of the grape-vine—and growers of Gordo Blanco and Sultana will have to keep a sharp look-out and keep the spray pumps going, else the crops will be lost.

Bordeaux mixture will be found the best spray at this time of the year for all fungus diseases. Should the San José scale put in an appearance after the leaves have started on the tree, the resin, soda, and fish-oil wash will be found the best to use at this season of the year. Never spray either trees or vines while they are in bloom, else the chances are that the crop will be destroyed. They may be sprayed a week before coming into bloom, and a week after the fruit is set.

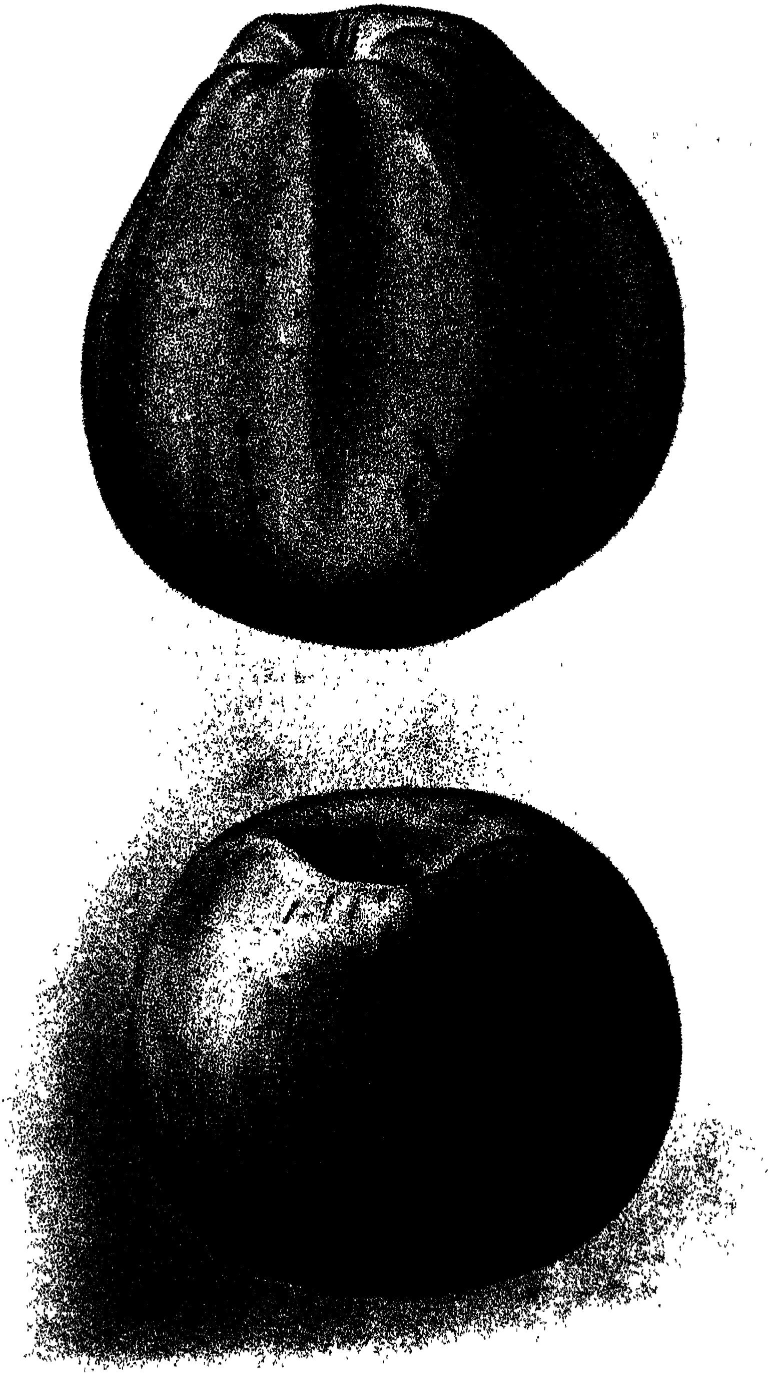
Green crops should be turned under this month, in order that they may become well rotted while there is still considerable moisture in the soil. If such crops are allowed to remain in until the land becomes dry, it will be found almost impossible to plough the soil, to say nothing of turning them under, and the chances are that in place of doing good the opposite effect will result, as the moisture in place of being conserved will have been taken up by the crop, in consequence of which the soil will have



Section of King Apple.

become hardened, and when ploughing is attempted the ground will break apart in lumps, and it will be found impossible to turn the crop under, which will thus dry up instead of rotting as it should. If rain should not fall it will be found almost impossible to bring the land to a proper tilth, and owing to the absence of moisture in the soil the trees will in all probability suffer severely during the summer months, and the fruit will be of little value, as it will be undersized and flavourless. Therefore, in all dry districts, see the crops intended for turning under as a green manure are not allowed to stand too long before being ploughed under.

In our coastal districts where rains are of frequent occurrence, there is not the same probability of dry weather overtaking the fruit-grower, consequently he can take more risks than his confrère in the interior.



Citrus trees may be pruned this month, and there are many orchards which would be greatly benefited by a thorough pruning. Do not permit the lemon-trees to grow high and willowy, but rather remove those tall weak limbs which are so often found growing up through the top of all lemon-trees, and keep the tree lower, when it will be found much easier to spray, fumigate, and pick the fruit from it. Oranges and mandarins are generally benefited by a cleaning out from the centre of all superfluous and worthless limbs, twigs, &c.

In every case see that the orchard is in thorough condition in every respect, as the future crop depends so largely on the condition in which the trees and soil are kept during the spring and summer months. See to it, therefore, that no blame can attach to you if they do not make a good start.

COLOURED PLATES.

King.—This apple appears to find great favour throughout the western states of America and Canada. As a fall dessert apple a good many found their way into the Sydney market from California during the months of September and October while the American line of steamers were running.

Yellow Bellflower.—Large, oblong, irregular, tapering towards the eye; smooth lemon colour; stalk long and slender, set in deep cavity; calyx closed, in rather narrow basin; flesh tender, juicy, crisp, with subacid flavour, and a favourite fall dessert apple in California.

Practical Vegetable and Flower Growing.

W. S. CAMPBELL.

DIRECTIONS FOR THE MONTH OF SEPTEMBER.

Vegetables.

DURING this month vegetables of varieties that have hitherto been backward should make a satisfactory start if the weather happens to be favourable, and occasional showers of rain should fall; and vegetables of tender kinds may, almost anywhere, be planted with safety.

As frequently advised in these directions, farm-yard manure should be used in good quantity, and particularly so during the summer, for one of the best effects of the use of abundance of organic matter is the conservation in the soil of much more moisture than would otherwise be the case. The effect, too, of such manure used as a mulch can hardly be over-estimated, should dry weather set in.

Asparagus.—Plant out early in the month.

Bean, French or Kidney.—The numerous varieties of this bean are classed as tender, for they cannot endure cold weather, and are liable to be cut down and killed by frosts. They may be sown in most parts of the State, and even in the cold districts, towards the end of the month. In the warm places plants are well above ground, and some are already bearing well. Sow seed of various kinds, including both dwarf and tall varieties, as well as a few Scarlet runners.

Bean, Lima.—Sow this useful bean in all warm localities, and try both dwarf and tall varieties.

Beet, Red.—This is one of the best of salad vegetables, and excellent for summer use. Make the surface soil as fine as possible, and sow in drills about 1 inch deep, making the drills about 18 inches apart. Two or three sowings may be made during the month (a little at a time) in order to keep up a succession of roots for use.

Beet, Silver.—This is an excellent summer vegetable, and very few plants should suffice if they are taken care of. Sow in seed-bed, and afterwards transplant the seedlings to heavily manured land, about 18 inches or so apart.

Cabbage.—Keep up a small stock of plants by sowing a little seed occasionally during the month, just according to requirements. Prick out a few seedlings occasionally in good, rich soil, and as they become strong little plants shift to permanent quarters. Use abundance of manure for the cabbage. Cultivate well during growth, and do not ridge up the plants with soil.

Cauliflower.—This, too, requires rich soil to enable it to come to perfection. It should be grown without any more check than it is possible to avoid in lifting and planting. Plant only during the month in cool districts, and supply water should the weather prove dry.

Carrot.—Sow a few drills and endeavour to keep a supply going, for this is a very useful vegetable and a wholesome one as well. Stock will enjoy any surplus not needed for the house. Make the surface soil as fine as possible, and let the drills be from 1 foot to 18 inches apart. Thin out seedlings well when they are 2 or 3 inches in height.

Celery.—When well grown, celery is a palatable and much appreciated vegetable. It needs abundance of manure and a good deal of moisture. Otherwise its quality will be but inferior, although the plants will be useful for cooking purposes. Sow a little seed in seed-bed or box, whichever is convenient. Prick out seedlings a few inches apart in good soil when the plants are 3 or 4 inches high, and afterwards transfer to shallow trenches made in well-prepared ground. Try self-blanching varieties, which are easier to blanch than the other kinds; for although termed self-blanching they will need the leaf-stalks to be covered from the light.

Chocho.—If procurable plant one or two in a situation where the vines can ramble about over a fence, wall, or anything suitable.

Cucumber.—In warm districts seed may be sown freely towards the end of the month, and under protection of some kind in the cooler places. Instead of making holes and placing manure in them, manure the bed where the cucumbers are to grow. Use plenty of manure, and work it well into the soil. Sow about half a dozen seeds in shallow depressions about 6 feet apart, and thin out the seedlings to two or three until the plants are quite strong, and then one plant should suffice.

Endive.—This species of chicory is well worth a trial by those who may not have grown it. The plant is like lettuce to some extent, and is not infrequently mistaken for it, and for which it is a useful substitute. Seed may be sown during the month, and when the seedlings are 2 or 3 inches high, prick out as advised for cabbage, cauliflower, &c. Then afterwards transplant to well-manured ground.

Leek.—Sow seeds, and plant out advanced seedlings in well-manured ground. This vegetable is a greedy feeder, and needs more manure in proportion than any other vegetable.

Lettuce.—Sow seed in seed-bed, prick out seedlings when they are well advanced, but avoid breaking more roots than is possible. Well-advanced pricked-out plants can be shifted during the month to well-manured ground. After this month, and during summer, the seed had better be sown in the bed where the lettuces are to grow, for if transplanted at that time of year the plants are very liable to run to seed.

Melons.—Of various kinds. Seed may be sown freely in early districts, and under protection in cold places. Treat as advised for cucumber.

Okra or Gumbo.—Seed may be sown in warm localities. This is a tender plant, and is liable to be killed by frosts. The plants should stand about 2 feet apart when set out.

Onion.—This is a good time to sow seed of all sorts of onions. The seed may be sown in seed-beds, and the seedling onions transplanted where they are to grow; or seed may be sown in prepared beds in the garden. The

soil should be heavily manured and well drained, well dug, and the surface made as fine as possible. Sow in drills, quite shallow, and 6 inches to 1 foot or more apart according to size of onion required. When seedlings come up, keep them free from weeds. The first method is the best to adopt for private gardens.

Parsnip.—Sow a few rows from time to time during the month. The ground should be dug deep.

Peas.—Sow a few rows from time to time during the month.

Pepper or Capsicum.—Seed may be sown in boxes or seed-bed during the month, and the seedlings can be transplanted as soon as they are strong and large enough.

Potato.—A few rows should be grown, as this is one of the best-liked vegetables. Manure well and drain well, and plant medium-sized whole potatoes, free from scab, potato moth, and other defects. The potatoes should be well shaped, with shallow eyes, and without any knobs. If only large potatoes can be obtained, cut into sets, and dry the sets in lime or wood ashes, and this will prevent decay and loss of food required for the growth of the sets until roots and leaves are formed. Plant in rows 2 ft. 6 in. apart, and drop the potato seed about 1 foot apart in the rows. Try Early Rose (true), Brownell's Beauty, and the Kidney varieties; or, perhaps, other varieties might prove better in some districts, and it is well to try several kinds.

Pumpkin.—Sow a few seeds in ground as advised for cucumbers, only plant seed wider apart.

Rhubarb.—Had better be planted early in the month.

Tomato.—Plants that have been raised and are strong enough may be planted out anywhere if they be protected from frosty nights. This vegetable does not require over-much manure; but if the soil is of an inferior character, a good heavy dressing should be applied. Liquid manure will be found invaluable for use during the progress of the plants. Provide supports, and allow only one stem to grow, removing all side shoots.

Turnip.—Sow a few rows in drills about 18 inches apart, and allow abundance of space between the plants, or else the bulbs will not increase much in size, and the plants will grow chiefly into leaves.

Vegetable Marrow and Squash.—Sow seeds in all warm localities, and treat as advised for cucumber.

Flowers.

This is one of the most interesting months of the year, for numerous species of plants are either in full bloom or making progress towards blooming. Violets, bulbs of many kinds, stocks, anemones, ranunculuses, and numerous other plants should be in their greatest perfection.

Roses should be growing well, and they should be examined almost daily to regulate their growth and to remove over-numerous wood-shoots and suckers.

Seeds of tender annuals, and also half-hardy varieties, may be sown in warm localities, and also in cool districts provided protection is afforded.

Plant out as soon as possible evergreens, perennials such as snapdragon, carnations, chrysanthemums, bouvardias, pelargoniums, and such like plants.

An Experiment with Beans.

A. W. WHITE.

I HAD for some time noticed the want of variety in many vegetables, more particularly in beans, and I was thinking of trying several new kinds, when I read in the *Agricultural Gazette* of an experiment with a number of beans new to us in New South Wales. For many years past we have been tied to about three or four varieties, like Canadian Wonder, Governor Denison, and Pale Dun, all good in their way, but lacking variety.

I sent to England and procured several varieties to try, and the result of my experiment may interest some of your readers. But first let me say that the seed costs more than that purchased locally—viz., 2s. a pint, as against 9d. and 1s. a pint for locally-sold seed—added to which is cost of packing in tin and postage, 5s. 8d.

The first variety tried was—

Sutton's Perfection.—A dwarf bean with a brown-speckled seed. This proved a very early variety, with beans about 5 inches long, almost round, and very fleshy; flavour very good. It also was a very heavy cropper.

Sutton's Earliest of All.—A climbing bean, about 3 feet high; very early, and an abundant cropper, a special feature being that it keeps bearing. One may pick full-sized edible beans while at the same time the plants are flowering for a second crop. The beans are small, and of good flavour. The seed is white, and very small, so that a pint contains more seed than any other variety.

Sutton's Tender and True.—I called this a climbing Canadian Wonder, which variety it resembles in many respects. It grows about 4 or 5 feet high. The seed is the same colour as Canadian Wonder.

Sutton's Magnum Bonum.—This proved to be the best bean tried. The seed is white, with brown markings, producing a plant about 2 feet high. It bears a heavy crop of beans about 8 inches long.

Sutton's Prince of Wales.—A climbing variety, with long pods of good flavour. Did not crop so heavily as other varieties.

Sutton's Prizewinner.—A climbing variety, similar to Scarlet Runner. Plants grew 5 or 6 feet high, and carried a fair crop of nice-looking beans from 6 to 10 or 11 inches long and an inch broad. These had to be cooked, however, when very young, about 4 inches long, as after attaining that size they became coarse and stringy. Distinctly a bean for exhibition purposes rather than for table. Flowers red; seed large, flat, and of a brown colour with black spots.

As a result of my experiments I decided to grow several of these varieties for the future, in preference to most sorts sold here, with perhaps the one exception, Canadian Wonder.

I might mention that the trial was made at Killara, and each variety proved suitable for the climate.

Farm Notes.

Clarence River District—September.

T. WALDEN HANMER.

The winter proved to be fairly mild in this part of the State, although light frosts continued well into August, and a good many of us were looking for rain to freshen up green crops, and paddocks that had been burnt.

Potatoes.—We find on the Grafton State Farm that Brownell's Beauty, Bliss's Triumph, Early Rose, Satisfaction, and Magnum Bonum do well, and in addition to these this season have planted small areas of Country Boy, Cambridge Kidney, Southern Star, Northern Star, Beauty of Hebron, and Circular Head. If any sets are left on hand, they should be planted with as little delay as possible.

Maize.—September, we find, is a good month to continue planting maize, and farmers who have "maize-sick" land would do well to try and manure it either with good farm-yard manure or by using bone-dust in the drills with the seed as dropped, but we prefer farm-yard manure if it can be obtained. We also favour the planting of maize single grains, 12 inches apart, and *not* four or five grains together, 3 feet apart; neither do we care for hilling maize, except for the purposes of throwing off excessive water in swampy places. Farmers would do better if, instead of hilling, they kept the scaffler or cultivator going between the rows as long as ever they can without injuring the corn by breaking it off. As a great number of our farmers are also dairymen, they would do well to put in an acre or two of maize broadcast—according to the quantity of cows they milk—and use it as green feed, or, if it is not required for green feed, put it into a stack as ensilage. If only a few more farmers in this locality would understand how simply good ensilage can be made, it would not be long before we should find ensilage become as common as hay, and no farm would be without it, and the benefit of ensilage universally known, and not spoken of as a "heap o' muck!"

Pumpkins and Squashes.—These delicious vegetables may safely be sown this month, and if the vines are troubled with ladybirds, dust ashes over them, or a little lime. Ironbark, Turks' Cap, and Crown are good eating pumpkins, and Delicata, Essex Hybrid, Custard, Moore's Cream and Long White Bush, and Warted, are good squashes.

Melons, Water.—Try Cuban Queen, Fordhock Early, and Kleckly Sweet—these all are great favourites.

Melons, Rock.—Early Hackensack, Nutmeg, Skillman's Netted, Golden Perfection, Kirkgegatch, and Cassabah Long will be found most delicious.

Cucumbers and Tomatoes should be remembered by the "man on the land"; they are easily grown, and very appetising on hot days.

Sorghums.—September is a good month to plant all varieties of this family for cow-feed; we favour Amber Cane and Planters' Friend most. As soon

as this is out in flower it is safe to feed to cattle, but previous to flowering it has proved itself deadly, so that it requires to be well fenced round. It also makes *good* ensilage. A farmer can never have too much green feed; if there is a surplus, it should be stored in some shape or form for a "lean" season.

Grass Seed of all kinds may be sown this month.

Teosinte.—This is a very valuable fodder plant, but really tropical. We succeeded in growing it last season on the Grafton State Farm to a height of 15 feet without any manure, and the seed also ripened. Cattle are very fond of it, and it is a plant worthy of every farmer's attention.

Peanuts, Buckwheat, Hungarian Millet, and Sunflower may also be sown this month, and are worthy of attention.

Remember to keep the surface soil well stirred as much as possible amongst all vegetation, as by so doing the soil is prevented from caking, and the moisture is conserved.

Glen Innes District—September.

R. H. GENNYS.

Oats.—Although late in most districts, oats may still be sown in New England for hay. Red Rust-proof and Algerian are the best two sorts for sowing late, as they come on quickly. Both are fine, sweet-hay varieties, not so liable to rust in the late season as Potato oats, and others like them. When sowing late always sow more thickly; so late as this month, sow about 2½ bushels to the acre for hay, as heavy seeding prevents too much stooling, and the plants mature earlier. White Tartarian is another good hay variety, being of an excellent colour, though not so sweet as the two first named. Half a cwt. of superphosphate to the acre will be found of benefit where the soil is not very rich, and will help greatly towards quick maturity.

Maize.—Get land ready for planting in the beginning of October. The soil should be deeply ploughed and well worked to get the best results. Also get ready for sorghums, millets, &c. A small sowing of these might be made to the end of the month; also sugar beets, and mangolds. Orchards should be ploughed up, so that any weeds that have started into growth during winter may be buried.

Sow cabbages, cauliflower, peas, beans, white turnips, &c., and get ready for pumpkins, melons, &c.

Potatoes.—Make small sowings of early varieties, such as Ashleaf Kidney, Cambridge Kidney, Burbanks, Royalty, and others of the Kidney variety. Use formalin for the prevention of scab, as follows:—1 oz. (liquid) commercial formalin to 2 gallons of cold water; soak for about two hours, then cut and plant in the usual way. A sprinkling of fine ashes is good to prevent moisture escaping from the cut tubers. Plant large well-shaped tubers. Do not sow in land that has produced scabby potatoes last year or the year before.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Sub-Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1907.

Society.	Secretary.	Date.
Junee P. A. and I. Association	... T. C. Humphrys ..	Sept. 4, 5
Cowra P., A., and H. Association	... E. A. Field ...	,, 4, 5
Albury and Border P., A., and H. Society ...	... W. J. Johnson ...	,, 10, 11, 12
Young P. and A. Association	... G. S. Whiteman...	,, 11, 12, 13
Cootamundra A., P., H., and I. Association	... T. Williams ..	,, 17, 18
Germanton P. and A. Society	... Jas. Stewart .	,, 18, 19
Wyalong District P., A., H., and I. Association	.. S. G. Isaacs ...	Oct. 1, 2
Adelong P. and A. Association...	... H. King	,, 15, 16

1908.

Society.	Secretary.	Date.
Dapto, Unanderra, A. and H. Society ...	... Geo. Lindsay ...	Jan. 8, 9
Albion Park A., H., and I. Society	... H. G. Frazer ..	,, 15, 16
Berry Agricultural Association... .. .	.. A. J. Colley ...	,, 21, 22, 23
Kiama Agricultural Association	.. J. Somerville ...	,, 25, 27
Wollongong A., H., and I. Association ...	... J. Beatson ...	Feb. 6, 7, 8
Alstonville A. Society	. Wm. W. Monaghan	,, 12, 13
Gunning P. A., and I. Society	.. W. T. Plant ...	,, 13, 14
Camden A., H., and I. Society	... A. Thompson .	,, 19, 20, 21
Kangaroo Valley A. and H. Association ...	... E. G. Wilkinson ..	,, 20, 21
Campbelltown A., H., and I. Society	... A. R. Payten ..	,, 26, 27
Newcastle and District A. H. and I. Association	.. Owen Gilbert ...	,, 26, 27, 28
Robertson A. and H. Association	... A. G. Ferguson ...	,, 27, 28
Bega A., P., and H. Society	... W. A. Züegel ...	Mar. 4, 5
Braidwood P. A. and H. Association	... L. Chapman ...	,, 4, 5
Yass P. and A. Association	... Will. Thomson ..	,, 4, 5
Tenterfield P., A., and Mining Society ..	... F. W. Hoskin ...	,, 4, 5, 6
Blayney A. and P. Association	... H. R. Woolley ...	,, 17, 18
Crookwell A., P., and H. Society	... C. T. Clifton ..	,, 19, 20
Gundagai P. and A. Society	.. A. Elworthy ...	,, 24, 25
Inverell P. and A. Association	... J. McIlveen .	,, 24, 25, 26
Hunter River A. and H. Association (West Maitland)	C. J. H. King .	,, 24, 25, 26, 27
Durham A. and H. Association (Dungog) ...	... C. E. Grant ...	Apl. 1, 2
Walcha P. and A. Association	.. S. Hargraves ..	,, 2, 3
Upper Hunter P. and A. Association (Muswellbrook)	Pierce Healy ...	,, 8, 9, 10
Deniliquin P. and A. Society	... L. Harrison ...	July 18, 19

[4 Plates.]

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VOL. XVIII. PART 10. OCTOBER 2, 1907.

Agricultural Gazette of New South Wales.

Improved Seed Maize.

GEO. L. SUTTON,

Manager, Cowra Experimental Farm.

AMONGST maize growers the general practice is to use for seed the most perfect ears produced in the main crop, the selection of such ears taking place at husking or shelling time. This practice is not now consistent with the advances made in other sections of agricultural practice, nor with the knowledge now possessed with reference to the principles of plant-breeding and seed selection. Such a method of obtaining seed is deficient in that it totally ignores the fact that, whilst the ear selected may be a perfect one, no effort has been made to determine whether this ear is prepotent, or has the power of transmitting its own good qualities to its progeny. Such a method also fails to recognise that each of the grains on the selected ear is the product of two factors, which, in an equal degree, mutually influence the qualities and characteristics

Fig. 1.—Tassel.

which that grain is capable of reproducing in the plant which grows as the result of the grain being planted. To understand the truth of this it is necessary to realise that seeds (like animals) are the progeny of male and female parent plants, the reproductive organs of which are the flowers. In the case of the maize plant, the male flower is known as the "tassel" (Fig. 1), and the female flower as the "silk" (Fig. 2). The pollen of

the male flowers—"tassels"—is conveyed by the wind to the female flowers —"silk"—and under favourable conditions an embryo grain is produced. The "silk" is a mass of fine hairs, each one of which is connected with what will, when fertilised by pollen from a "tassel," become a grain of maize. If any particular hair of the silk receives no pollen, or an insufficiency, or infertile pollen, no grain will be formed at the base of that hair, and an imperfectly filled ear will result.

Experiments conducted by the Ohio Experiment Station prove that fine ears do not always furnish the best seed maize. That station selected twenty-four specially fine ears all of the same variety, all of equal appearance, and of equal germinating power. The grain from each of these ears was planted in a row by itself, so that each ear had the same chance as its neighbour. One ear out of the twenty-four yielded at the rate of 114 bushels per acre; another, 112; and a third, 104; whilst other ears yielded 55, 65, and 77 bushels per acre. The row that yielded least had 58, and the row next the highest 15 barren stalks.

Fig. 2.--Silk.

The present practice of selecting the best ears is a good one, in that it is in recognition of the law that "Like produces like," and it makes certain that at least one of the parents (*i.e.*, the mother-plant) of the grains in that ear had the desirable quality of productiveness, with a possibility of it being transmitted; but it totally ignores the influence which the sire-plant (*i.e.*, the plant supplying the pollen) may have had upon the grains in the ear. The sire-plant which furnished the pollen may have been as barren and unproductive as that illustrated (Fig. 3), and if so, there is every probability that its influence in the direction of barrenness would largely offset the influence exerted by the mother-plant in the direction of productiveness.

The stock-breeder who wants to improve his stock, in the quickest and readiest manner, certainly exercises as much care in the selection of the sire as in that of the dam, and as the laws which govern the reproduction and development of plants are substantially the same as those governing the reproduction and development of animals, it follows that the seed-grower must recognise the influence which the sire-plant has upon the seed. Unfortunately, it is not possible in all cases with plants, and especially difficult with maize, for the grower to select the exact sire he wishes to use; but it is possible for him to ensure that the sire used is from a productive strain, and he can, by destroying such, prevent undesirable male plants transmitting their bad qualities, the worst of which is unproductiveness.

It is self-evident that a plant like that illustrated in Fig. 4 is more desirable as a sire, because it is more productive, than the barren stalk shown in Fig. 3. Stalks like this latter should be relentlessly removed from any portion of the crop intended for seed. Removing barren stalks from the seed-plot may not altogether prevent their appearance in subsequent seed or main plots, for their occurrence is a matter which is influenced to some extent by the character of the soil, and by the climate; but that such a practice is largely helpful in lessening their number is shown by the results obtained at Cowra this year. Fig. 5 is an illustration of part of a crop with its preponderance of barren stalks, the seed for which was raised in the ordinary manner. Fig. 6 is an illustration of part of a crop a row of sire plants in the seed-plot grown from seed raised in a plot from which the barren stalks have been systematically removed. This year there were no barren stalks in the seed plot.

Fig. 3. An undesirable sire (barren).

To destroy the barren stalks in a crop of any size is not a practical plan, but if the barren stalks are to be destroyed, and this must be done if the quality of the seed maize is to be improved, the adoption of a plan whereby the grain intended for seed is grown in a plot distinct from the main crop becomes necessary. Such a plan is a distinct advance upon the present method of selecting the best ears from the main crop, and is only in accordance with the tendency of modern agricultural practice which is demanding that all seeds for main crops be grown in special seed-plots conducted upon plans in accordance with the known laws relating to plant-breeding, and where a vigorous selection to eliminate undesirable characteristics and to maintain and strengthen desirable ones is practised.

A seed-plot for maize is preferably situated in an isolated position with regard to other maize crops, as pollen is carried a distance of half a mile, but

in the absence of such a position the seed-plot can be placed in the centre of the main crop of the same variety, but in the latter case the improvement in the quality of the seed is not so rapid as in the former, for the pollen of the plants in the main crop is likely to fertilise some of the plants in the seed-plot, and the plants in the main crop are not the result of such selected seed as those in the seed-plot.

The results of experiments at the *Illinois Experimental Station indicate that cross-pollination increases the vigour of the resulting plants, whilst self-pollination and close-pollination decrease the vigour. A plant is said to be self-pollinated when pollen from any "tassel" falls upon the "silk" of the same plant; it is said to be close-pollinated when the pollen from the tassel of one plant is transferred to the silk of another plant, both plants being produced by grains taken from the same ear; it is said to be cross-pollinated when the pollen from the tassel of one plant is transferred to the silk of another plant, which was produced by a grain taken from a different ear of the same variety.

Fig. 4.—A productive plant; a desirable sire.

In growing seed maize cross-pollination should be encouraged, self and close pollination guarded against, and, what is most important of all, the productive and prepotent strains should be determined and selected. In a properly arranged seed-plot it is not difficult to give proper attention to these important matters.

The most productive strains are determined by planting the grains from each selected ear in a single row by itself, and comparing the yields from these rows with each other. Naturally the highest yielding rows are the ones which are the most prepotent and the ones from which the ears for next year's seed-plot should be selected. In choosing these ears, the greatest importance should be attached to the quantity of grain each contains; at the same time the habit and character of the plant which produced them should be considered, as also the position occupied by the ears on the stalks, for it is obviously an advantage to have

* Bulletin No. 100. Investigations at the Illinois Experiment Station have shown that after the first year the effect of continued cross-pollination, which results from detasselling alternate rows in the seed-plot, was to increase the yield per acre by more than 10 bushels.

the ears situated low down on the stalk where they can easily be gathered at harvest time. The colour of the core, and similar minor matters, are comparatively insignificant, and should receive but little attention.

Fig. 5.—Barren stalks in a crop. Cobs on two plants.

Plants, like animals, possess individuality, often in a very marked degree, and the differences between the plants in individual rows, though of the same variety, will probably surprise the grower who plants according to

this system for the first time. By planting individual ears in separate rows their characteristic differences can be seen and, if desired, fixed by selection, so that this method also affords the grower an opportunity of securing that type of plant most suitable for his particular district and conditions.

Self-pollination is absolutely prevented by detasselling the rows from which the seed-ears for planting the succeeding seed-plot are to be selected. In practice every alternate row—the even-numbered rows—in the seed-plot are detasselled; for the sake of convenience the plants in them are called "mother" plants. Fig. 7 is an illustration of a row of "mother" plants in the seed-plot at Cowra last season.

Close-pollination is guarded against, and cross-pollination encouraged, by planting in the odd-numbered rows, *i.e.*, in the rows alternating with those

Fig. 6.—The result of weeding out the barren stalks.

to be detasselled, seed from ears as distantly related as possible to those used for planting the rows which are to be detasselled. For the sake of convenience, the plants in the odd-numbered rows are referred to as "sire" plants.

At the *Illinois Experimental Station, where maize-breeding has received special attention for the past eleven years, the practice is to use for seed only grain produced on plants in the detasselled rows, and from each of the selected detasselled rows to choose the best four ears in the row; two of the

* Bulletin No. 100.

selected ears are used to produce "mother" plants, the remainder to produce "sire" plants. The method adopted to obtain the greatest degree of cross-pollination possible is to divide the seed-plot into four equal parts, and to plant the even-numbered rows (*i.e.*, those containing the "mother" plants) in each quarter with ears from the selected rows in that quarter; but the seed for the odd-numbered rows (*i.e.*, those containing the "sire" or pollen-supplying plants) with ears from the selected rows of another quarter of the plot. The plan adopted is to plant the odd-numbered rows in quarter No. 1

Fig. 7. A detasselled or mother row.

with ears from quarter No. 4; in quarter No. 2 with ears from quarter No. 3; in quarter No. 3 with ears from quarter No. 1; and in quarter No. 4 with ears from quarter No. 2. In addition to this arrangement, the selected ears from each quarter are planted in accordance with a well thought out sequence, and not *seriatim* according to the consecutive order of the numbers of the rows from which the ears are selected. The sequence decided upon is as follows:—For the detasselled or even-numbered rows, 2, 6, 10, 4, 8, 12, 2, 6, 10, 4, 8, 12; for the odd-numbered rows, 2, 6, 10, 4, 8, 12,

4, 8, 12, 2, 6, 10. The six numbers, 2, 4, 6, 8, 10, 12, are used as representing the actual numbers (in their consecutive order) of the rows from which the selected ears were taken.

In alternate years the sequence for the odd-numbered rows is altered by transposing the two sets of six figures; the sequence for these years being 4, 8, 12, 2, 6, 10, 2, 6, 10, 4, 8, 12.

These matters are likely to be made a little clearer if a suppositious case is taken, and the method of arranging the ears for planting worked out. Imagine that a seed-plot of ninety-six rows is to be planted, and that the selected ears (four from each row) required for planting these rows were selected from the following rows of last year's seed-plot:—

1st Quarter—6, 8, 10, 14, 18, 20.
2nd Quarter—30, 34, 36, 40, 42, 44.
3rd Quarter—52, 54, 58, 60, 64, 66.
4th Quarter—76, 78, 80, 86, 90, 92.

Row 1 and the succeeding odd-numbered rows in the first quarter (rows 1—24) will be planted with ears grown in the fourth quarter (rows 73—96). For this purpose two ears from each of the following rows 76, 78, 80, 86, 90, 92, are available, and these are planted in the following sequence, 2, 6, 10, 4, 8, 12, 4, 8, 12, 2, 6, 10, where the numbers 2, 4, 6, 8, 10, 12 represent the numbers 76, 78, 80, 86, 90, 92 respectively. We find by substituting 76 for 2, 78 for 4, 80 for 6, 86 for 8, 90 for 10, and 92 for 12, that the odd-numbered rows will be planted as follows:—

Row	1	with an ear	from row	76	in previous	seed-plot.
,,	3	,,	,,	80	,,	,,
,,	5	,,	,,	90	,,	,,
,,	7	,,	,,	78	,,	,,
,,	9	,,	,,	86	,,	,,
,,	11	,,	,,	92	,,	,,
,,	13	,,	,,	78	,,	,,
,,	15	,,	,,	86	,,	,,
,,	17	,,	,,	92	,,	,,
,,	19	,,	,,	76	,,	,,
,,	21	,,	,,	80	,,	,,
,,	23	,,	,,	90	,,	,,

The even-numbered rows are planted with ears selected in the same quarter of the last season's plot; the selected rows in this case are 6, 8, 10, 14, 18, 20. As previously stated, the sequence for the even-numbered rows is 2, 6, 10, 4, 8, 12, 2, 6, 10, 4, 8, 12, where the numbers 2, 4, 6, 8, 10, 12, represent the numbers 6, 8, 10, 14, 18, 20, respectively. By substituting 6 for 2, 8 for 4, 10 for 6, 14 for 8, 18 for 10, and 20 for 12, we find that the even-numbered rows will be planted as follows:—

Row	2	with an ear	from row	6	in previous	seed-plot.
,,	4	,,	,,	10	,,	,,
,,	6	,,	,,	18	,,	,,
,,	8	,,	,,	8	,,	,,
,,	10	,,	,,	14	,,	,,
,,	12	,,	,,	20	,,	,,
,,	14	,,	,,	6	,,	,,
,,	16	,,	,,	10	,,	,,
,,	18	,,	,,	18	,,	,
,,	20	,,	,,	8	,,	,,
,,	22	,,	,,	14	,,	,,
,,	24	,,	,,	20	,,	,,

To plant the other quarters of the plot the same system is followed,--the ears to plant the even-numbered rows in each quarter being obtained from the same quarter of the previous year's seed-plot, and the ears to plant the rows in quarter No. 2 (rows 25-24) being brought from quarter No. 3 (rows 49–72), those from quarter No. 3 (rows 49–72) being brought from quarter No. 1 (rows 1–24), and for quarter No. 4 (rows 73–96) from quarter No. 2 (rows 25–48).

The value of good seed and the necessity for planting such, if the most profitable crops are to be obtained, is now generally recognised. The method of growing maize-seed by planting the grain from individual ears, in separate rows, of detasselling the plants in alternate rows and all barren plants, is the only way by which the best seed can be produced, and it is on the same lines as the method so successfully used for the improvement of wheat in this State. Until this method is adopted the best results will not be obtained from the importations of maize-seed which take place from time to time, because, by the time the imported varieties become acclimatised they have deteriorated to some extent, as the result of the method of seed selection practised. Owing to the ease with which varieties of maize cross, the work of growing seed-maize cannot be carried on at the experimental farms to the same extent that wheat-breeding and seed-raising is. Growing seed-maize is, therefore, largely a matter for individual farmers in the maize-growing districts to take up. The method described, once understood, is not difficult to practise, and our Department will at all times be ready to assist those interested in overcoming the initial difficulties. Farmers in U.S.A. are doing this work, and have formed associations for mutual aid in carrying it out; in this State the Agricultural Societies in maize districts could do much to arouse an interest in seed-raising on up-to-date lines, and in doing so would not only be performing one of their legitimate functions, but at the same time would be encouraging work which must add to the wealth of their particular district.

Now is an opportune time to commence this work. Those who have not or cannot obtain unshelled seed-ears to commence growing improved seed this year can make ready for next season by detasselling the barren stalks in a portion of their main crop this year, and selecting ears for next year's seed-plot from the most productive plants in the detasselled portion.

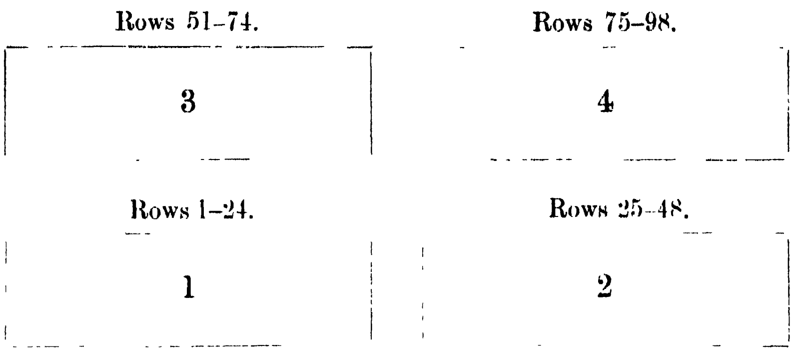
Those who still have the seed-ears in an unshelled state, can commence the work of improvement during the present season, in accordance with the method described.

Briefly stated, the instructions for growing seed on the lines indicated are as follows :--

The plot, as far as other maize is concerned, is preferably situated in an isolated position If such a position is not available, the plot may be planted in the centre of a larger area of the same variety, but should be at least half a mile distant from any other variety of maize.

At least forty-eight and preferably ninety-six rows should be planted, each row with the grains from a separate ear. The length of rows will be

regulated by the size of the ear; all the rows should be the same length, and from 5 to 10 chains long. The rows are to be planted 4 to 4½ feet apart, or the usual distance adopted in the district, with single grains dropped every 16 inches. If found convenient the seed may be dropped with a planter, provided care is taken to see that the box is completely emptied after each row is sown, and before the grain from another ear is put into it. If the site will admit, it is convenient to divide the seed-plot into four quarters in the following manner:—



And when numbering the rows it is convenient to dispense with the numbers 49 and 50.

During the growing season the crop should be kept free from weeds, and the moisture conserved by frequent cultivation.

As soon as possible after the tassels appear, they are to be removed from the plants growing in the even-numbered rows. The detasselling is done by pulling out, rather than cutting off, the tops at the time when a careful pull will separate the tassel from the top joint. In order to do the detasselling thoroughly, it will be necessary to go over the rows several times. Barren, or other undesirable plants in any row should also be detasselled.

At harvest time select the most productive of the detasselled rows. The number of rows to be selected in each quarter of the plot is one quarter the number of rows planted. From each of these selected rows choose, for next year's seed-plot, four ears, each the produce of one of the four most desirable plants to be found in the row. Each of the ears should be labelled with the number of the row from which it is taken.

The remainder of the grain from the detasselled rows, and including the remainder from the selected detasselled rows, can be used for planting a main crop.

The grain from the rows which are not detasselled, is likely to be self or close pollinated, and on that account wanting in vigour; it should not, therefore, be used for seed.

Sheep at Wagga Experimental Farm.

HAND-FEEDING TRIALS.

G. M. McKEOWN.

THE rainfall for six months from December to June has been only 349 points, therefore for about eight months we had no green grass, until the arrival of the June rains, when a slight growth set in. Hand-feeding of all

Ewes and Lambs being fed from troughs.
Wagga Experimental Farm.

stock has therefore been necessary. A flock of 444 ewes, in a bare paddock of 69 acres, has been fed on the following daily ration, viz. :—½ lb. melon,

Ewes and Lambs being fed from boxes.
Wagga Experimental Farm.

¾ lb. barley silage, 1⅛ lb. wheaten chaff, and 3 oz. bran, the lambing resulting as shown hereunder.

A second flock of 690 ewes were fed as follows, viz. :—1 lb. barley silage, 1¾ lb. meadow hay, and 6 oz. wheaten chaff. At present the count of lambs from the latter flock is 436, with about 50 ewes yet to lamb.

Pure Shropshire ewes have maintained their good condition on an allowance of ¾ lb. wheaten chaff and ¼ lb. bran, with a little straw.

LAMBING Tables, 1906.

Breed. Sire.	Breed. Dam.	Age.	Per cent. of lambs marked.	Average weight.	Average growth per day.	Per cent. of ewes assisted at lambing.
		wks.		lb.	lb.	
Shropshire	Lincoln x Merino .	20	93	104·83	·741	4·45
Shropshire	Merino . ..	21	75 28	86·25	·587	19·10
Lincoln ..	Merino ..	20	82	90·08	·643	28·57
Leicester	Merino	17	83·67	89·58	·752	26 53
Leicester .	Lincoln x Merino ...	16	93·87	92·66	·827	2·04

LAMBING Tables, 1907.

Dorset-Horn ..	Lincoln x Merino	...	92			8
Dorset-Horn ..	Merino	...	88			12
Border-Leicester .	Lincoln x Merino ...	...	77·65			6·49
Border-Leicester ..	Merino	..	80			4
Suffolk	Lincoln x Merino ..	...	78	..	..	4
Suffolk	Merino	...	56	.	.	12
Lincoln	Merino	..	47·30	.	.	5·40
Shropshire	Lincoln x Merino ..	...	65		..	3 3

The above ewes, with the exception of the last mentioned, were aged, and they were allotted to the rams in the following proportions:—

1 Dorset-Horn to 75 ewes. 1 Suffolk to 75 ewes.
2 Border-Leicesters to 220 ewes. 2 Lincoln to 74 ewes.

The latter flock consisted of 665 ewes from 4 to 5 years old. A number of ewes have yet to lamb, which should bring the average over 70 per cent.

The appended tables show the effect of the recent severe conditions on the respective breeds which were weighed, and the results attending hand-feeding by various methods:—

CROSSBRED Sheep.

Weight losses, October, 1906, to April, 1907.

Rainfall, December to June, 349 points.

Breed.	Spring Weights.	Average Losses.
	lb.	lb.
By Shropshire Rams from Lincoln x Merino Ewes	104·83	4·43
,, Shropshire Ram from Merino Ewes	86·3	10·45
, Lincoln Ram from Merino Ewes	90·1	13·88
,, Border-Leicester Ram from Merino Ewes	89·7	10·18
,, Border-Leicester Ram from Lincoln x Merino Ewes ..	92·8	11·46

Artificial feeding solely.

Sire.	Dam.	Individual Gain.	Individual Loss.	Average Loss.	Average Gain.	From	To—
Ration :—1 lb. wheaten chaff, ½ lb. oats, ½ lb. dry molasses, ¼ lb. bran, costing ¾d. per day.							
		lb.	lb.	lb.	lb.		
Shropshire ..	Lincoln x Merino	6 to 13	...	...	10·20	19 April	6 May
Lincoln .	Merino .. .	3 to 12	.. ...	..	7·80	19 ,,	6 ,,
Border-Leicester	Lincoln x Merino	1 to 12	.....	...	7	19 ,,	6 ,,
Border-Leicester	Merino	3 to 6	. ...	..	7	19 ,,	6 ,,
Shropshire .	Merino	Nil to 9	.. ..	...	4·20	19 ,,	6 ,,
Same ration as above plus ½ lb. lucerne chaff.							
Border-Leicester	Lincoln x Merino	5 to 15	. .	...	9·20	6 May	21 May
Shropshire .	Merino	Nil to 9		..	9·20	6 ,,	21 ,,
Border-Leicester	Merino	3 to 6		.	8·60	6 ,,	21 ,,
Lincoln ...	Merino . .	1 to 12	..	.	4·40	6 ,,	21 ,,
Shropshire ..	Lincoln x Merino	7 to 9	3 to 7	.	3	6 ,,	21 ,,
Shropshire ..	Lincoln x Merino	4 to 13	2 to 9	.	5	21 ,,	3 June
Border-Leicester	Lincoln x Merino	1 to 13	1	·60	.. .	21 ,,	3 ,,
Shropshire	Merino	Nil to 3	Nil to 9	1·	. .	21 ,,	3 ,,
Lincoln . .	Merino	3	2 to 7	3·20	. .	21 ,,	3 ,,
Border-Leicester	Merino	1	....	4·40	.	21 ,,	3 ,,

Very cold weather prevailed during the last-mentioned period, the conditions probably affecting the results.

SEVENTEEN Fat Crossbred Wethers—4, 6, and 8-tooth.

Ration :—½ lb. wheaten chaff, ¼ lb. molasses (dry), ¼ lb. bran, ¼ lb. oats, with a little paddock picking.

Individual Weights. 21st May.	Individual Weights. 3rd June.	Gain.	Loss.	Individual Weights. 21st May.	Individual Weights. 3rd June.	Gain.	Loss.
lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
160	163	3	....	174	165	..	9
130	133	3	......	165	161	..	4
148	147	..	1	216	210	..	6
142	137	.	5	165	159	..	6
177	173	...	4	175	166	.	9
199	188	...	11	200	192	.	8
181	179	..	2	182	181	..	1
165	161	...	4	148	149	1	..
182	179	..	3				

Average loss, 3·88 lb. each.

EIGHTEEN Shropshire Rams (hoggets), fed for forty-six days. Average ration :—2¼ lb. lucerne, ¼ lb. chaff, ½ lb. oats, ¼ lb. bran. Cost of ration, 1¼d. per day.

Individual Weights.		Gain.	Loss.	Individual Weights.		Gain.	Loss.
22nd March.	6th May.			22nd March.	6th May.		
lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
98	103	5	...	71	80	9	..
89	98	9	...	69	83	14	...
92	99	7	...	91	112	21	..
103	108	5	...	88	103	15	
93	102	9	..	53	59	6	..
90	107	17	.	71	83	12	
74	94	20		73	85	12	..
122	136	14	.	73	86	13	..
70	77	7	.	57	68	11	...

Average gain, 11·44 lb. each.

The same rams were then fed on a ration of 1 lb. wheaten chaff, ½ lb. lucerne chaff, ½ lb. dry molasses, and ¼ lb. bran, the result showing an average loss of ½ lb. each in sixteen days.

The Weeds of New South Wales.

A PIG-WEED (*Amarantus viridis*, L.).

J. H. MAIDEN,
Government Botanist and Director of Botanic Gardens, Sydney.

A NUMBER of leafy weeds with inconspicuous flowers, belonging to the genus *Amarantus*, are known as Pig-weeds. They are distributed over a large area of the globe; some are natives of Australia, but far more are found in other countries. A number of non-Australian species have found their way to this country and have become weeds.

A description of the genus *Amarantus* will be found in the *Flora Australiensis*, v, 212.

Description of *A. viridis*.

An erect or decumbent annual of 1 to 2 feet.

Leaves petiolate, ovate or ovate-lanceolate, obtuse, rather thin, but the pinnate veins usually prominent underneath, 1 to 2 inches long.

Flowers small; green, with an obtuse appearance, the lower ones in small axillary sessile cymes or close clusters, the upper ones in rather loose or interrupted spikes, forming a short terminal panicle, the central spike 1 to 3 inches long, the lateral ones few and short.

Bracts and *bracteoles* narrow, not exceeding the perianth.

Perianth-segments, three, narrow, erect, scarcely ¾ line long; falling off with the fruit.

Pericarp rugose, indehiscent, free from the seed, about as long as the perianth.

Styles, usually three. (B.Fl. v, 215).

Synonym.—Euxolus viridis, Moquin, is a synonym. So also is *A. Blitum* of most authors, but not of L.

A. Blitum belongs to the section Euamarantus, and *A. viridis* belongs to the section Euoxolus. The chief distinction between the two sections is that the pericarp opens circumciss in the former, and splits irregularly in the latter. This is a very sharp distinction, but the two species are very commonly confused.

A. viridis seeds freely and is often a great nuisance. It is a dunghill weed, common in gardens and by road-sides, and is a weed of waste-places generally, springing up like magic. It should be pulled up before it has had time to mature its seed.

It is a native of many temperate countries, and Bentham introduces it into the *Flora Australiensis* tentatively as an Australian plant, but I do not think it is a native.

Uses.—Having spoken so unkindly of this weed, let us see if we can say anything in its favour. Many years ago I wrote in my "Useful Native Plants of Australia" as follows concerning it :—

Mr. F. M. Bailey points out that besides being a fair substitute for cabbage, the leaves have been used externally with advantage as an emollient poultice. I have had this plant cooked, and I do not hesitate to pronounce it a valuable vegetable. It is an excellent substitute for spinach, being far superior to much of the leaves of the white beet sold for spinach in Sydney. Next to spinach it seems to be most like boiled nettle leaves, which when young are used in England, and are excellent. This *Amarantus* should be cooked like spinach, and as it becomes more widely known, it is sure to be popular, except amongst persons who may consider it beneath their dignity to have anything to do with so common a weed.

I am, of course, only addressing spinach-eaters. The young tops should be used, and my experience is that when one wants a dish of this weed one cannot get it, and when one does not want it for culinary purposes one sees a great deal of it.

But its room is better than its company, and it should not be conserved, even as a vegetable.

Roxburgh says of this plant: "A native of various parts of India, appearing most frequently as a weed in gardens during the rainy and cold seasons. The tender tops are eaten by the natives, though not so much esteemed as the cultivated sorts." (*Flora Indica*, iii, 605.)

Explanation of Plate.

1. Flowering branch, natural size. (N.B. The terminal leaves are often much smaller than the basal ones.)

2. The same, somewhat enlarged.

3. Leaf. Note the prominent venation of the under-surface and the outline of the apex, slightly 2-lobed.

4. Fruit, much enlarged, showing the three narrow perianth-segments and the three styles.

5. Seed, greatly enlarged ; the actual size being indicated by the very small circle.

Diseases of Fowls.

[Continued from page 213.]

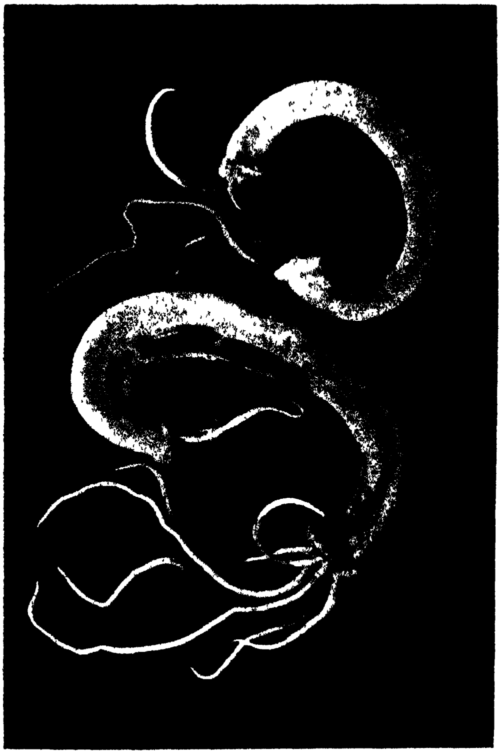
G. BRADSHAW.

CHAPTER IV.

INTERNAL PARASITES.

Worms.

IT has now been shown that roup and cholera are the most devastating diseases of the poultry-yard, affecting old birds and young alike. There is, however, a third enemy no less destructive than the former, but more dangerous from the fact that it is not so easily detected, and is largely confined to young stock, great havoc usually resulting before the cause is even suspected. I refer to worms; and there is no doubt that more losses are due to these internal pests than to any other chicken ailment.



Worms protruding from a section of intestines of fowl.
Taken from a six-weeks old chicken running in a grassed yard, but with access to a manure heap.

There is not a poultry-man of any experience but who has had good and bad seasons in rearing chickens. One year they may do so well that, excepting accidents, every well hatched one will be reared to the adult period; the following season, under exactly the same conditions, when the chickens reach a month or six weeks of age, they become pinched-looking in the face, their wings droop, have an anæmic appearance, a tired-looking gait, and despite a ravenous appetite, invariably die. The owners experiencing this usually try various remedies, which might be effective in many complaints, but resultless in the instances mentioned, from the fact that the disease has been mistakenly diagnosed,

it really being a case of worms, rather than tuberculosis, colds, inbreeding, wrong feeding, or other ailment, the remedial measures being thus useless, the deaths continue, and at such a rate that the whole season's operations are carried on at a loss. My opinion and experience is that, apart from the large number of chicken deaths due to defective or badly-managed foster-mothers, inbreeding, &c., far the largest percentage of the many thousand deaths during chickenhood are absolutely due to intestinal worms. (See illustration.)

Dr. Salmon, an American authority, in his "Diseases of Poultry," gives more space to worms than any other writer. The bulk of it, however, is too technical for the ordinary poultry-man, whose A to Z of sick fowls is to know the ailment, the prevention, and cure, if any. The above authority gives a list and names of no less than forty-five parasitical worms found in the intestines of feathered stock, but for the purpose of this paper those grouped as tapeworm, the round worm, and the gape-worm will suffice. About ten specimens of the tapeworm have been found in the intestines of the common fowl, and four of these have been found as infesting the fowls of Australia.

The literature on tapeworms is both incomplete and abounds in contradictory matter, but there is a kind of agreement that they are not of such serious consequences to fowls as the round worms. My observations, however, lead me to a different conclusion, believing that whenever either the round or tape worms are found in excessive numbers, the consequences are most serious.

As there is really so little known of these intestinal pests in Australia, except the fatalities resulting from such, I purpose giving the opinions of the most competent American and other authorities, the result of recent exhaustive research, in the hope that they may at least be the means of minimising the fearful losses which annually occur in many Australian poultry-yards.

Dr. Cobb, late Pathologist to the Department of Agriculture, in his manuscript dealing with the tapeworms of Australia, contributes the following:—"I feel sure that in the vast majority of cases the diseases of poultry are never carefully diagnosed, and in very many cases the fatalities are referred to the wrong causes, or simply never referred to any cause. There is a great amount of ill-health in confined runs, more especially in towns, referable to obscure causes, among which it is probable that tapeworms occupy a prominent place. There is no doubt that in many cases where the poor condition of the fowls is due to the presence of tapeworms the fact remains wholly unknown, and that even where an epidemic of such occurs, in some cases the cause remains a mystery. This fact is due to the small size of the segments of these worms, and to the fact that they are shed singly for the most part, and hence are very inconspicuous objects in the excreta of the infested fowls. As to searching the entrails for decisive evidence of the presence of these parasites, I suppose it is almost never done by the ordinary poultry-owner. If more of them

realised the great extent to which fowls are infested with worms of various sorts, a reform in this direction might take place. It is a fact that in many fowl-runs scarcely a bird is free from worms. The round worms are seldom voided, and hence are rarely seen, and, as before remarked, for various causes, the segments of tapeworms easily escape notice, even when they are being voided in large numbers.

Entrails are things to be spoken of only in a disgusted whisper, and to be put out of sight and out of mind as quickly as possible; so the parasitic worms are kept out of sight and out of mind, and hence often manage to hold undisputed sway in the fowl-run. If once these parasites are brought into the light, some discussion is sure to follow, and discussion sometimes leads to action, and fowl worms of all kinds are poor hands at withstanding action. It is sometimes said that these parasites do no harm, but this is a fallacy. The truth is, that in moderate numbers parasites ofttimes do not inconvenience their host very much. Only when their numbers rise much above the average quantity found among animals in a state of nature do parasites cause serious injury. Any reasoning person will at once see, however, that domesticated animals, on account of the nature of their confinement, are much more liable to parasites than wild animals, and fowls are subject to this rule. A fowl scarcely acquires parasites except from another fowl, either directly or indirectly, hence the closer the confinement the more chance there is of infection. This accounts for the great abundance of worms in confined runs, especially in towns.

The great thing to remember is that fowls become infested with worms only through the agency of other worms, and this is the whole secret of preventive measures. The whole question of where the worms come from simmers down to this: What fowl did the worms come from? What fowl had worms, whose eggs, passing out with the excrement, in some manner found their way into the fowls at present infested? Perhaps some new fowl, bought and introduced into the run, brought with it worms, and eggs or young of these worms were thus scattered about the run, and found their way into the other fowls.

What lesson shall we learn from this? First, that great care should be taken in the disposal of fowl manure. All careful poultry-keepers clean up under the roosts frequently, possibly simply because they have been taught so to do. They will find their practice upheld by powerful arguments from the student of tapeworms, and those poultry-keepers who have not hitherto followed this excellent practice may now be induced to do so in the hope of extra profit, which, of course, arises in two ways—(1) the preservation of the manure, and (2) healthier fowls, with greater reproductive powers. Connected with this part of the subject is the raking over and occasional spading of the whole run, which is very beneficial in keeping worms in check, especially if the run be damp. This gives a good opportunity to observe whether any part of the ground is occupied by earthworms. As these creatures are the intermediate host

for some of the tapeworms of the fowl, it is well to exclude them from the fowl as much as possible. This is quite contrary to the prevalent notion, but nevertheless it is quite evident that if earthworms contain the cysts that turn into tapeworms in fowls, earthworms are dangerous food for fowls. The particular species of earthworm that acts as the intermediate host for the tapeworms of the fowl has become introduced into Australia, and is very common near and in many of the towns and cities of the country.

Another matter of consequence is the arrangement of the roosts. As most of the manure collects under the roosts, it is advisable to keep the fowls quite away from under their roosts, which can be done by carrying wire-netting of large mesh to the floor under the roost in such a manner that the droppings fall through out of reach of the fowls. The manure should not be allowed to become dry and converted into dust, for in that case it may, in the form of dust, contain worm eggs, blow about the fowl-yard and contaminate the food.

Never throw the food on the ground in an infested run. Have a special clear space to feed them on, and from time to time saturate this place with boiling water, concentrated solution of copperas, formalin, or some other powerful and inexpensive disinfectant.

Apply the above rules vigorously to chickens, and no fear need be entertained of mysterious deaths from worms.

There have been violent outbreaks of worms in the past, and, doubtless, they will occur in the future. A word as to procedure in such cases may therefore find a place here. In case of a violent epidemic, the most urgent necessity is quarantine. Set apart a place, and into this put all the sick and suspected fowls, making a discrimination among these two latter classes, and keeping the suspects out of actual association with the actually diseased. The various precautions already suggested should be applied vigorously to the sick and suspected birds in quarantine, and special precautions should be taken with the healthy fowls.

The necessity for these precautions will be well understood by those who have seen the frightful rapidity with which epidemics sometimes spread among fowls. It is much wiser to depend on prevention than upon cure. This old adage applies with additional force to fowls, as the remedial measures are comparatively expensive and uncertain.

The following treatment is suggested for poultry. Turpentine in daily doses of not more than half an ounce is sometimes used with good results. The turpentine should be medicinal turpentine, not any turpentine that happens to be handy. The dose is that for a fairly vigorous fowl, and it should be less of course for one emaciated and weakened by disease. The dose may seem large, but it is based on experience. A safe rule is from one to three teaspoonfuls, according to the size of the chickens. An ill chicken of very small size can hardly be dosed successfully with turpentine; but once having acquired vigorous health, and attained the

age of a few weeks, success is more certain should the chicken then fall sick. This remedy may be used for intestinal worms of any sort.

Areca nut, powdered and made into pills with butter or fat, may be given. Bran may be added to these ingredients. The dose is 30 to 35 grains of the powdered areca nut. A chemist will weigh out a dose, from which the remainder may be judged by bulk if care is exercised. Liquid male fern extract, made into pills with bran flour or meal. Half a teaspoonful will answer for a full-grown fowl. The medicines should be fresh or they will do little good, and in general they should be followed the next day or later on the same day, by a teaspoonful of castor oil.

The following on the subject was lately contributed to *Farm Poultry*, an American utility poultry journal:—"Parasitic worms—particularly intestinal worms—infest many fowls, whose owners do not at all suspect their presence. By 'infest' I mean that the worms are present in sufficient numbers to be troublesome. Some good authorities say that intestinal worms, like lice on the skin and feathers of the fowl, are almost invariably present, but as long as they are not too numerous they make no trouble, and may even have some function of benefit to the fowl. Just what this is, or how it operates, I have never seen stated. Worms, when present in troublesome numbers, interfere seriously with the health of the fowl. Considering the conditions produced by them as diseases, it is found that the symptoms are not marked until a rather acute stage, and even then are not so unique as to immediately identify them. All in all, the detection and effective treatment of these parasites that live within the body of the fowl is one of the most puzzling propositions poultrymen, to whom it comes, have to deal with.

"The general symptoms of worms in the intestines are the same. The kind of worm present can only be determined by finding them in the droppings, or by *post-mortem* examination, showing them fixed in the parts of the fowl. If the droppings, as voided by the fowl before treatment, show no traces of worms, a vermifuge may be given, and the fowl kept where its droppings are easily examined. It is not certain that no worms are present because none are evacuated. Some worms are very difficult to dislodge; but a dose of the remedy to endeavour to secure from the droppings confirmation of the suspicion of the presence of worms in the intestines of the fowl is the only way practicable for the poultry-keeper, short of killing one or more fowls, and making a careful examination of the intestines."

Briefly, the round worm receives its name from its shape, is more common than the tapeworm, and best known to poultry men, being found in masses in the larger intestine. A few of these are found in almost every fowl, and do little harm, the trouble arising when they multiply into hundreds, they then affecting digestion, then comes diarrhœa, loss of appetite, and ultimately death. It is rarely that a round worm is passed in the fowl's excrement, but when it does it soon dies, but is more frequently eaten up by some other fowl. Round worms are white, and

in young chickens of from one quarter to 3 inches long, in adult fowls, up to 5 inches, and, when numerous, are found in slimy masses.

The tapeworm is less common than the round, and nearly all authorities consider them less fatal, occurring in adult fowls more frequently than in chickens.

It is recorded that, in 1897, a tapeworm 3 feet long was brought into the office of the *Reliable Poultry Journal*, Quincey, U.S.A., taken from a Wyandotte hen. The hen in question ate heartily, but lost flesh and gradually weakened. The owner could not discover what was the matter with her. She had no cold, ate well, but became distressingly poor and weak. Finally, he thought of worms. Acting on this theory, he kept her without food for thirty-six hours, then gave her a full feed of stewed garlic cut in short lengths. She ate heartily of this, and the next day the owner had the 3-foot tapeworm in alcohol. The hen began to mend immediately, regained her normal flesh, and soon was as well as ever.

The late Lewis Wright in his great work on this subject says:—"A variety of these parasites infest the intestines of fowls, and some of them occasionally reach the oviduct, and may thus be found even in the albumen of the egg. Such an occurrence should always be followed by treatment; but the other usual symptoms, such as wasting away, slow movement, &c., are so common in other diseases also that we can seldom really diagnose worms unless they are found whole or in portions in the droppings, or else in the intestines of dead birds subjected to *post-mortem* examinations. The usual causes are probably foul ground or water, contaminated meat or other animal food, or neglect to remove their manure."

Treatment.

The following extended article was written a few years ago by a medical man and clever poultry doctor as well:—

The havoc done to young poultry by parasitic or intestinal worms is greater than is caused by lice and other external parasites. The former are not easily detected, hence the danger is greater. The contagion is spread by the droppings containing either worms' eggs or sometimes worms' germs only, which are fertilised either by insects or by fermentation, when the droppings accumulate in wet condition. All the causes of weakness, diarrhœa, septicæmia, cholera, &c., may be traced to intestinal worms. In fact, amongst fowls' ailments, the roup or diphtheria is perhaps the only one spreading both by the sneezing or saliva of the bird and by its droppings. The most perfect cleanliness is not sufficient, for even then a fowl-run or roosting-place smells if disinfectants, such as cinder dust (no cinders nor ashes), powdered charcoal, carbolic powder, or Pasteur solution is not used. Wherever there is an offensive smell there are offensive germs. I described years ago the sterilisation of the soil and wood by the use of solution of copperas, but must repeat again that the whitewashing of fowl-houses and the spreading of slaked lime on the soil are remedies of the old school of poultry-teaching. They give a clean appearance for the time being, but kill very few germs except by smothering if the lime is thickly applied. The use of lime increases considerably the cost of outbuildings, for nothing destroys the wood lining more than lime, whereas copperas increases its durability, even without any paint being applied. When spread on the ground, according to the nature of the soil, lime, instead of sterilising any germ, on the contrary, fertilises it. Lime is in most cases a fertiliser instead of a steriliser (if the term is correct). Considered from an agricultural point of view, slaked lime is a manurial stuff accelerating germs and germination, and not a destroyer of life or steriliser. To come back to intestinal worms: When their appearance is shown, it is generally too late to use remedies, therefore some regular diet or preventive treatment must be resorted to,

and nothing is better for this purpose than soaked cereals—wheat, oats, barley, &c.—in onion, garlic, or salted water. All the worm and microbe germs are destroyed, or at least expelled, by this treatment. The robust constitution of the Frenchmen of the south of France, compared with the consumptive aspect of the Parisians, has been rightly attributed to the use of garlic by the former. Not only is every solid meal seasoned with the fragrant bulb, but men and women chew it like Northmen chew tobacco. To prepare onion for water, mince it either by machine or by chopping, put it in a small calico bag, and squeeze the juice out when the bag is immersed. To prevent the eyes watering when slicing onions by hand, the cutting must be done underneath the level of the water. Garlic can be treated in the same way; it has the great advantage of being in stock all the year, whereas onions decay quickly. A small piece of garlic is equal to several pounds of onions in strength of fragrance, and therefore is more economical. If both bulbs are scarce or too expensive, very salt water will do, although it would not kill all the germs of some species. Many people may be surprised to learn that worms are found by millions in the middle of bags of salt stored for a while. To keep the soaking bath for several days during hot weather, it is better to use water which has been boiled. Readers are warned that the use of onion or garlic water is wholesome for every kind of bird, but salt is injurious to ducklings, and fatal to turkeys, who will be killed even by the use of wheat soaked in salt water.

As in all diseases affecting human beings or domestic stock there are various remedies, and sometimes what is effective in one case may be of small good in another. Intestinal worms in poultry, by unquestioned authorities, have received different treatment. Appended are a few which have been given in reply to correspondents, by English and American authorities, any of which, if used in time, will be effective in saving the lives of many thousands of chickens, which in spring and summer are consigned to early graves. Lewis Wright says the best remedy for a good-sized fowl is 2 grains of santonine, or 10 grains areca nut, or 3 or 4 drops of the oil of male fern in salad oil. Professor Woodroffe Hill advises the best remedy: 1 grain santonine with 7 grains of powdered areca nut for an adult fowl, a fourth or sixth of this for chickens, according to age.

In the following instance, the cures are those recommended by experts on English and American poultry journals:—

Worms.—My hens and chickens have lots of worms. I have killed and examined some of them and find quantities of worm in the intestines. Some of them are thread-like and others like tapeworms. The birds eat heartily and yet are just skin and bones. I feed corn, oats, and the chickens get ground corn and chick feed. Have water and grit handy. Why do they have worms, and how do they get them? Can I get rid of them?

The worms are passed from one bird to another. The small worms, or eggs, come from the infected birds with the droppings and are eaten by others with the food. Even the soil itself may be infected with the worms. It will be necessary to put the birds on fresh soil, pay great attention to keeping the coops clean, and feed all food on clean boards or dishes. Cut out all ways of infection. Give the birds a dose of castor oil, enough to clean out the bowels, and then follow by the use of anti-ferments in the drinking water. Mix up bran with castor oil until it is sticky enough to hold shape when pressed in the hand. Then add to it equal bulk of middlings or corn meal, and spread out so that the birds will get a teaspoonful each. Then add to every quart of drinking water one-half teaspoonful Epsom salts. Give them this drink for several weeks, watching its effect on the bowels. You do not want to keep up any looseness of the bowels after the castor oil has done its work. The "salts" is for making the intestines an unhealthy place for worms.

Worms.—It is difficult to say how the bird came by the worms, not knowing anything of your place; however, poultry often have them. To cure the hen, allow her to go supperless to bed; next morning give her ten drops of oil of turpentine in a teaspoonful of sweet oil, about two hours after give her a breakfast of scalded bran in which you have mixed a teaspoonful of Epsom salts. Repeat this every two days for a week, when I think she will be cured. Between times feed her chiefly on bread and milk, to which has been added a good pinch of ordinary table salt.

Worms in Fowls.—We hardly know what is the cause of worms, although we are inclined to believe that overfeeding fowls with dry and musty grain has much to do with it. It must be remembered, however, that these parasites exist in the healthiest fowls; they are certainly a source of great harm when they are present in abundance, and they cause poultry to look poor and thin. The best thing is to expel the worms inhabiting the stomach and intestines, and for this purpose it is well to give medicine to birds when the crop is nearly empty—say half an hour before the morning soft food is allowed, on alternate mornings for a week. As medicines, the following are recommended: A 2-grain pill of santonine, followed by castor oil, half a teaspoonful; 4 to 6 grains of areca nut in a teaspoonful of sweet oil; 10 to 15 drops of oil of turpentine in a teaspoonful of sweet oil; or, 6 to 8 drops of oil of male fern in a teaspoonful of sweet oil. (These doses are for adults; about a quarter of the quantity is sufficient for chickens.) Great care should be taken to isolate all patients, and to remove all droppings as often as practicable, placing them on ground remote from the range of the flock. The best preventive is to add a pinch or two of table salt to all soft food, especially to scraps of meat and vegetables, putting the salt into the water with which the food is prepared. Care should be observed that all food is of the best, the meal and grain being fresh, and not musty as is so often the case.

Worms, Cockerils not Thriving, &c. (HANSON).—You have certain proof that at least one bird had worms, whether the others have or not. It would be a good plan to put the other birds up in a separate pen for a few days and treat them for worms. Do not give the birds any supper, and no breakfast next morning until two hours after they have had ten drops of oil of turpentine in a teaspoonful of olive oil. Their first meal should then be scalded bran; add a good half-teaspoonful of Epsom salts for each bird. Miss a day, and repeat the treatment the next day, and every other day until no further signs of worms are seen on the floor of the pen. The floor should be kept clean; only have a light sprinkling of sand on the bottom, and burn all the sweepings out of the pen daily. It is more than likely that the birds have worms, and they will neither put on flesh nor feather nicely whilst annoyed by these parasites. The question is how do the birds come by the worms? Is there any decaying animal matter about, or is the land thoroughly tainted and sodden, and is the poultry-house scrupulously cleaned out week by week? It is little use curing the birds if they are likely to be reinfected with worms when they go back to their old runs again.

The above remedial measures are those suggested by the most competent Old and New World authorities, not all medical men, but life students of poultry, whose matured deductions and recommendations may be accepted as authoritative on these detested and destructive poultry pests. The remedies are all simple, and if administered in time will be effective in saving some of the many thousands of chicken life which are annually sacrificed to this intestinal plague.

(*To be continued.*)

Description of Ensilage-making & Silos at Picton.

F. G. WALEY, Ass. M. Inst. M.E.

ALTHOUGH the vast advantages of silos in the Australian climate have been thoroughly advertised by the Agricultural Departments in all the States, it is only quite recently that farmers have taken to experimenting with them in a practical way by placing them on their properties, and this has prompted the writer to give the results of silos erected at Mowbray Park, Picton, together with some figures, which may be a guide to others, and thus forward the good work of silo-erecting and fodder-conservation, for these results, although incomplete, are convincing proof of the

The Silos at Mowbray Park.

enormous value of ensilage and its importance to mixed farming as well as to grazing in a country where periods of great prosperity, ample rainfall, and a vast growth of herbage are followed by corresponding periods of drought.

If the personal pronoun occurs more often than good literary style or modesty might dictate, I trust that the readers of the *Agricultural Gazette* will understand that this is unavoidable when personal experiences are all that can be given, and where the writer consequently has to point to given fact and draw deductions from his own observation as apart from general experiences.

After careful thought and the reading of much literature on the subject, I decided last year to erect silos on a considerable scale, originally

for dairy purposes purely, and with the object of feeding from fifty to sixty cows all the year round, and growing maize for silage purposes.

The land around Picton is of a very light loamy character, with a considerable quantity of sand, and the rainfall for many seasons has been very low. For each of the two years that I have been farming in that district the rainfall has averaged less than 20 inches, and has not been well distributed nor seasonable in character. As a result, the grazing capacity of the land has been practically a negligible one, and cultivation has had to be depended on for feed required, while, owing to the light character of the soil and the dryness of the seasons, this cultivation has had to be of an intense character, and the land to be heavily manured artificially to produce even a moderate crop.

The form of silo finally decided upon was new to this State, and was designed and the construction carried out under the supervision of Mr. E. G. Stone, C.E., who has since erected a number of silos of similar character in various parts of New South Wales, and who now, I understand, is considering a proposition by one of the big land and mortgage companies to erect a number of them on their properties solely for the purpose of making ensilage of the vast growth of grass and thistles that are recoverable in a good season, and the cutting of which improves the growth of young grass and its character for sheep-feeding. In an interview with the manager of this company, he stated to me that in cases where they had stacked over 400 tons of hay they found that mice had practically reduced all this hay to chaff, and that rabbits had followed the mice and burrowed tunnels in all directions through the stack, rendering the whole practically useless for feeding after two years' storing, which was another very strong argument in favour of ensilage as against hay.

The silos at Mowbray Park are four in number, twenty-four sided (which is practically circular), each 16 feet in diameter and 24 feet high, grouped under one roof, and having an estimated capacity of about 140 tons of silage in each tub, or in all, 560 tons. The framework of the tub is of expanded metal, in the form of a strong webbing, which is fastened round the frame of hardwood, fortified by wrought-iron bands to take excess of pressure. The webbing is surrounded inside and out with a total thickness of 1⅛ inch of cement, which, settling around the expanded metal, forms a ferro-concrete of extreme strength and absolutely impervious to the ingress of air. The floors are composed of concrete, and the four silos are grouped with the doors facing inwards, and a wooden shoot between the four silos serves to empty any one of them, and enables a man in the silo to throw the feed out of the door into this shoot, whence it drops automatically, through the centre opening, into a cart backed underneath to receive it, and which can, therefore, be loaded under cover. The doors of the silo themselves are of a new design, being constructed upon the principle of a boiler manhole, with an insertion joint that is squeezed out when the door is closed, and thus prevents any leakage of

air—a common fault with most doors of tub silos. The installation is practically indestructible, and if cement-washed once every three or four years should last at least fifty years without requiring any further renewal or attention, while with reasonable care bestowed upon the hardwood uprights, there is no reason why the life of the silo should not be double the period named. The cost of the four silos, including the shoot, was £350, erected on the spot.

The silos are filled by a No. 16 "Ohio" combined ensilage cutter and blower, which chaffs up the whole of the green corn and cobs and blows it up a funnel, at the end of which is a distributor and a socket so arranged that the four silos can be filled without shifting the position of the chaff-cutter, which is fixed on a concrete bed, and is belt-driven from a Robey 10 h.p. portable engine, working at 160 revolutions and driving the chaff-cutter at 800 revolutions per minute. This machine will chaff and elevate as fast as two men can feed it, and its actual capacity is about 8 tons per hour. My experience proves that this machine will work considerably quicker than the corn can be drawn from the field, and that before starting to run it is well to accumulate a good quantity of material alongside it.

In anticipation of the silos being finished and the machinery, which I imported direct from America, being landed in February, I had planted 30 acres of maize of the Red Hogan variety in October, and, favoured by seasonable rains, the crop early in December was looking very well; but from then on continuous dry weather was experienced, added to which late delivery of the machinery and delay in the completion of the silos prevented me cutting the corn until the end of April. I shall refer to this question at a later stage of this article, as it has an important bearing on the quality of maize ensilage, and will also touch on what our experience would tend to show to be the best distances at which to plant corn intended for silage.

The maize was cut with a Deering maize harvester, which cuts the stalks close to the ground, and binds and throws out the bundles of maize ready to be picked up by the carts which follow it in the field. This Deering harvester gave thorough satisfaction, and ran without any hitch; and although I had five carts employed bringing the maize to the silo, and the longest draw did not exceed 1,000 yards, on an almost level grade, the harvester had completed its work two days before the carts had completed lifting the bundles; but the string used in binding the bundles must be cut and carefully removed before allowing the fodder to be chaffed. Scarcity of carriers, and the fact that the speed with which the harvester would work and the chaff-cutter dispose of the ensilage, were unknown quantities in our first year's experience, caused the expense of making the silage to be heavier than need be assumed as a normal figure.

As closely as I have been able to estimate by careful measurement of the cubic capacity of the silos, we made only 200 tons of ensilage off our 30 acres, which will clearly show the results of a bad season; and these

figures will make farmers on average maize-growing land smile, for in ordinary seasons, and in land of good quality, good green maize should cut 30 tons weight to the acre on a most moderate estimate; and I do not think an average of 15 tons would be considered excessive by men who have grown it even under unfavourable circumstances; still a return of barely 7 tons per acre will justify planting and growing maize under the exceptionally bad conditions referred to, and will enable farmers in the very worst seasons, and with indifferent soil, to keep their heads above water and wait for the return of more favourable and normal conditions.

The actual cost of labour in cutting, carting, chaffing, delivering to silo, and tramping the silo as delivered amounted to £41 13s., or 4s. 2d. per ton.

The manure used had an analysis of 9·75 per cent. of phosphoric acid, 5·02 per cent. of potash, and cost £7 5s. per ton delivered on the ground: 4 cwt. per acre was drilled in with the seed, which made the cost of manuring 29s. per acre.

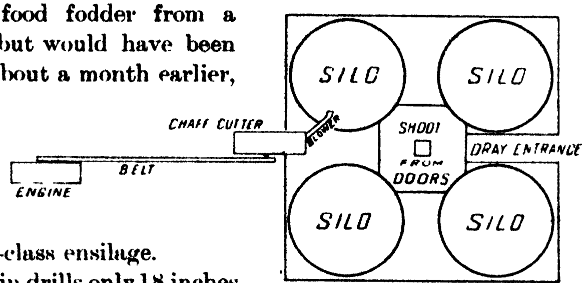
The ploughing and harrowing of the land cost 15s. per acre, and it was twice cultivated at a cost of 8s. per acre; and I might here state that the harrowing of this corn twice after the dry spell had set in was the salvation of the crop, even although the total return was very low.

Adding the above figures together, the total cost per acre of growing the corn may be set down at 57s., and allowing 3s. per acre for incidentals, the cost on a 7-ton return per acre amounted to £3, or 8s. 7d. per ton, and the total cost of the silage to 12s. 9d. per ton. This is an estimate which it will be seen gives a liberal margin for contingencies, and which would be greatly reduced on anything like an average weight of crop.

The late cutting of the corn to which I have already referred resulted in its being more matured than would have been advisable to give it a maximum advantage from a silage point of view, although from a feed point it was at its best; for, from careful and exhaustive studies of the changes occurring in the condition of the corn plant, which have been conducted in America and abroad, it has been proved that as corn reaches maturity the nitrogenous or flesh-forming components decrease, while the starchy components increase remarkably; and American papers have laid down a careful table showing these changes, which, without following in detail, prove that the gross weight of the crop increases up to the milky stage, and decreases thence until the corn is ripe. This represents about 1 per cent. between the stage at which the cobs are in a milky condition and between their being glazed, and nearly 10 per cent. between the milky stage and the stage of ripe corn. During the same period the starchy contents of the corn double themselves, and the protein contents increase nearly 50 per cent., the main loss of weight being in the water in the crop. From a feed point of view, therefore, the largest amount of material is only obtained when the corn is well ripened, as when the corn plant has reached its total growth and height it still contains

only one-half to one-third of the dry matter it will attain if left to maturity. On the other hand, it is unwise to delay cutting until the corn plant becomes dry, for silage will not spoil through being too wet, but will mould if too dry; and the ordinarily accepted time at which the best results are obtained by siloing corn is as soon as possible after the cobs have glazed, and before they have become hard; and the wastage from cutting too late lessens the quantity and deteriorates the quality of silage, and thus nullifies its better chemical analysis.

My silage when cut was too dry to yield the best results or to give a uniform silage material; but, on the other hand, it contained a very large proportion of nearly-ripe corn, which made it an excellent food fodder from a milking point of view, but would have been better ensilage if cut about a month earlier, although, having regard to the dryness of the season, it would have even under such circumstances failed in making a really high-class ensilage.



Ground plan, showing how the silos are arranged.

The corn was planted in drills only 18 inches apart, and was also set too thickly together in the rows, with the idea that as it was being cut for ensilage this would not prove detrimental; but, as a matter of fact, the Americans have proved that maize for silage requires to be planted as carefully and no closer than the same maize when intended for cobbing, especially in light soils: and my experience confirms this, and this year I intend planting the corn in drills, 3 feet 8 inches apart, and planting single grains as nearly as possible at 6-inch intervals in the drills, and believe that thereby a much better crop per acre will be obtained. Of course, in good soils, with sufficient moisture, corn could be planted much closer, or even broadcast, for ensilage purposes; and so much depends upon both soil and season that no hard-and-fast rule can be laid down to guide farmers as to the best method of planting their grain for the purpose of making ensilage; and so long as it is borne in mind that practically as good a matured crop at a slightly earlier stage is required to give good ensilage as is required to furnish cob corn, and also that to get the best results the seed should be as carefully chosen for sowing in the one case as in the other, the practical farmer on his own land will be the best judge as to the thickness with which to sow. When planted too close together, not only is more seed required, but the plants shade each other, and both from lack of sunshine and of moisture fail to reach proper development, and a less amount of available food constituents are produced.

Owing to the season continuing dry, I found it necessary to open my silos and feed from them earlier than I had anticipated. The first silo

was opened at the beginning of August, or three months after the silage had been made, and I was then able to find out the faults referred to previously, and also to test the virtues of the ensilage as supplied to feeding stock.

The material had not sufficiently compressed, both from want of time and from want of pressure, as the silo from which I was drawing it had been only rather more than half filled; but it had a beautifully sweet smell of a malty character, and was sound and in excellent order, and I commenced feeding it both to sheep and cows, and both took it greedily, while the horses on the farm would leave their hard food and follow the ensilage cart.

The grain with which the ensilage was plentifully strewn had scarcely had time to much change its colour or to get more than partially softened, and the percentage of dry leaf in the ensilage also proved considerable; but the chopped stalks had softened, and were sweet and firm, and excellent food material.

Round the edge of the silo I found about 6 inches or 7 inches of moulded material unsuitable for feed, and comparing this with the diameter of the silo, it shows a wastage of about 7 per cent. I hope, by more careful tramping as well as by the addition of water, when making next year's ensilage to lessen this wastage, although from American experience the figure named is a low one; but the value of adding water in moderate quantities to ensilage in the process of making can scarcely be over-estimated, and I intend to connect a hose and pump to the silos before next season with this object in view, and where possible would highly recommend this course to all farmers.

The photograph given represents the silos in a group, and shows the engine and chaff-cutter at work, as well as the blower, up which the ensilage is driven and distributed over the silo; and a small ground plan of the silos and shoots is also shown, as well as a photograph of the silo under construction, showing the method of same.

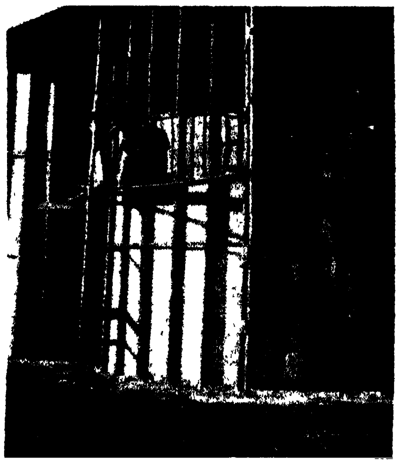
This article is only a brief summary of a few points gathered from my experiment, not to be looked upon as a literary effort or as an attempt to more than touch lightly on a few features of ensilage-making when worked out under particularly unfavourable conditions; but I am at the present time feeding the ensilage in troughs to 250 ewes with young lambs and some sixty stud ewes, as well as to a small herd of pedigree Ayrshire cattle; and the three cows milking are averaging over 3½ gallons, and are being fed with this silage, mixed with about one-fifth its weight of chaffed lucerne and a handful of bran; and the sheep on ensilage have ample milk, and are rearing their lambs very satisfactorily, and but for the storage of this ensilage I have practically no available feed for any stock at the present time.

Assuming the ensilage to have cost 17s. per ton on the ground, and 2½ tons to be equal to a ton of hay, it would mean in my case a saving of considerably over 100 per cent. in the cost at which I could buy feed

at the present time; and although I should not like to say that it pays to feed ordinary sheep at this price, still to bring them through the last of dry winter months, when we should reasonably look forward to good grass in the spring, represents an additional source of profit both from wool and lambs which would have been entirely absent but for the silos, as under the condition of the country during this winter I could not have afforded to have kept any but my stud sheep on the property.

With anything like an average season, I am thoroughly satisfied that the experiment is a highly payable one, and the freedom from anxiety which it ensures cannot be over-estimated; and should these remarks serve to persuade others to proceed further on the line of this, one of the great national needs at the present time, they will have served their purpose.

Incidentally, it may be interesting to learn that the last census of silos in America showed their number to be little short of 1,000,000. They have, in fact, in all advanced dairies taken the place of any other form of fodder preservation, for their immunity of risk from fire is a great advantage, apart from larger questions; and no modern dairy in the States is designed or laid down without silo capacity to feed its stock. Generally speaking, it may be considered to have been proved that it is cheaper to cultivate and conserve with silos than to graze over unimproved land, and this must tend to become more and more the case as closer settlement renders large grazing areas of good country increasingly difficult to obtain, and the capital value of same correspondingly higher.



Silo under construction.

Milky and variegated thistle, and all forms of coarse herbage, make excellent ensilage, while the custom in America of cutting alfalfa (lucerne) and siloing it is rapidly taking the place of feeding it green or turning it into hay.

In an American pamphlet I saw it stated that it is estimated that over one-third of the maize grown in the States is grown for silage purposes alone; and while this figure would seem very high, there seems little doubt that the growing of maize in those States for that purpose represents a very large proportion of the industry, while in a large number of cases in which maize is grown for the production of corn, the stalks are shredded and fed to the cattle as stover, a course fully justified by the large proportion of feeding matter left in the stalks, which in Australia are generally left to go to waste.

Sparrows.

A. J. MITCHELL, Echuca.

IN the article which appeared in the June number of your journal the house sparrow is, I think, taken too cheaply, and that if he is left to be dealt with by natural enemies only, and to find his own level, that level will within a comparatively few years be a very high one.

Mr. McKeown gave a word of warning in 1890, and I would now go so far as to say that at the present time his warning has been more than justified, for in the grain and grape growing districts sparrows have already become even a more serious pest than the rabbit. The latter can be kept in check by wire netting and poison, and usually only comes from the immediate neighbourhood; but nothing has yet been found to keep sparrows out of a field of early grain or a vineyard, and they will travel a considerable distance and in large numbers to favourable spots.

It seems to be a problem which will eventually be the greater pest and do the most damage to the country as a whole, namely, the rabbit to the large landholder or in thickly timbered or stony country, or the sparrow to the grain, vine, or fruit grower, closer settler, and intense cultivator, by whom it should be remembered the greater part of the best land is held.

There are already districts where ten years ago the rabbit literally swarmed, and now, thanks to the efficient manner in which the Pastures Protection Boards have exercised their powers, there are very few rabbits to be found; but in those same districts the sparrow has increased almost as much as the rabbit has decreased.

In addition to the immense amount of harm which the sparrow does to fruit and crops, and to say nothing as to the nuisance he is about a house, and the amount of poultry food which he consumes, there is a very much more serious and even dangerous aspect in the country districts, as almost everyone depends on rain water for drinking purposes, and during summer-time the water is frequently rendered not only objectionable but absolutely unwholesome by the sparrow. We must remember that we are at the Antipodes, and that what applies in Great Britain is often the reverse here. In Great Britain there are far more natural enemies, and large numbers of sparrows can be and are killed during the winter, especially when there is snow on the ground, for although people there will not, as a rule, kill other birds except those which take fruit, the sparrow is looked upon as a nuisance, and is given very little more quarter or consideration than a rat or a mouse. In addition to this, nests, as a rule, are more keenly sought after and destroyed, partly on account of the population being so much greater, and partly because boys are not only allowed a free hand, but are encouraged to destroy them;

whereas here sparrows make use not only of buildings and old straw sheds, but of the holes in trees, where they cannot be reached; and few people seem to bother about them.

I have seen an African boxthorn hedge several chains in length with nests so thick that they would average a nest to every yard, and either eggs or young birds in every nest. It is apparent that sparrows are increasing in enormous numbers at present. They have no natural enemy; they can weather a drought better than any other bird, for if they cannot find food in one place they will go somewhere else, and have a change of diet if necessary. I have seen gardens in and near country towns where nearly all the grapes, figs, and every other fruit is eaten or spoilt by sparrows before it is properly ripe, and if nets are not very carefully put on sparrows will get under.

The agriculturist near towns, and, in fact, anywhere in the country where there are a few houses, is already noticing the damage done to his crops, particularly the early ones, and after the crops have been stripped the sparrows consume heads of grain lying on the ground, which would otherwise be feed for the farmer's stock.

When one tries to think of a remedy, and how the sparrow is to be destroyed and kept in check, it seems, if anything, even more difficult than the rabbit problem, for in some districts, by clearing, wire netting, and poisoning, rabbits, where the Pastures Protection Boards have enforced their powers, have been practically kept in check; but the same remedies could not be applied to the sparrows, except as far as the destruction of nests is concerned, as the sparrow moves about at his own sweet will. I have seen thousands camp in the hot summer nights in shady elm trees in a town, and as soon as it was light in the morning they go off, you might almost say, in clouds. No one knows where, but probably to the stubble fields, orchards, and vineyards, to spend the day and return in the evening.

To poison or catch sparrows in any number, except with nets at night, takes a very clever man; and after a few have been killed or caught it is hopeless to try the same remedy for a long time, as they even seem to know poisoned from other grain.

Some good can be done at times with a gun and dust-shot, especially near their roosting-places, about dusk: but to provide for their effectual destruction would, I am afraid, be a very hard task, though if provisions somewhat similar to those in the Rabbit Act were enforced against people on whose premises or land any nests were found, a considerable benefit might be derived, and more particularly so if power were given to compel the destruction of any hedges or trees where nests were found in any number. At any rate, I would strongly urge that further discussion should be invited, as that seems the most practical way of providing ways for coping with the pest.

Weather Conditions during August, 1907.

A. NOBLE,
Meteorological Department, Sydney Observatory.

On the 1st an energetic disturbance appeared over the Great Australian Bight and moved rapidly eastwards, extending over our State and Southern Queensland by the 2nd. This disturbance resulted in good rains throughout New South Wales; the falls in the western districts ranging from 6 to 167 points, and on the central-western slopes from 48 to 184 points. Light showers continued to fall over southern districts until the 10th, when another depression, which had been situated over the Bight during the previous day, increased in energy, and resulted in light to moderate rains over southern districts and central areas as far north as Mudgee. Thence finer conditions prevailed, broken only by thunderstorms at a few widely-scattered stations. On the 13th, however, an intensification took place in the low pressure, resulting in boisterous N.W. to westerly winds.

On the 18th thundery conditions developed over northern areas, resulting in light to moderate rainfall on north coast, northern tablelands, and north-western slopes, extending as far west as Kunopia and Bingara. On the 19th an energetic low pressure formed over the Australian Bight and moved rapidly eastward; this was responsible for light rainfall over the S.W. portion of our State which, by the 21st, had covered the whole of New South Wales, with the exception of the north coast and parts of the south coast districts. The falls, though general, did not in any case exceed ¾ of an inch. Then fine weather ruled generally until the 24th, when light showers again set in along the southern border and extended eastwards as far as the western slopes, and northwards as far as Ivanhoe, Nymagee, and Warren. The amounts registered, however, were mostly under 10 points. On the 28th, as the result of a rapid development over the southern districts, light to moderate rain was recorded in parts associated with thunder, and chiefly confined to S.W. slopes and southern tablelands.

The coldest periods of the month was on the 19th, when 14° were registered at Kiandra, 20° at Carcoar and Rockley, 21° at Muswellbrook and Nimitybelle, 22° at Cooma, Goulburn, and Walcha, 23° at Marsdens, 24° at Molong, Murrumburrah, and Picton, and 25° at Bombala, Braidwood, Cootamundra, and Moss Vale.

The following is a comparison of the chief meteorological elements over India, together with Australia, as far as data are available, for the month of August, 1907:—

	Departure from normal.		General Conditions (referring to State as a whole).
	Pressure.	Temperature.	
	Inch.	Degrees.	
India	- ·03	- 0·2	Abundant rainfall.
Sydney	- ·12	+ 1·6	Moderately wet W. of Mountains, very dry on coast and tablelands.
Melbourne	- ·19	+ 1·6	Moderately wet.
Adelaide	- ·17	+ 0·6	Slight defect in N., excess in S.E.
Perth	·06	+ 1·9	Excessive in extreme S.W., about normal elsewhere.

Taking New South Wales as a whole, the rainfall during August shows a slight improvement upon that of the two preceding months, the distribution being above average beyond the Darling, over Western Riverina, Central-western slopes, Upper Barwon and tributaries, but great defects, approaching 100 per cent. below normal, again extended over the coastal districts and tablelands. The distribution was as follows:—

Division.		Percentages. Above normal.		Below normal.
Over North Coast ...	from ...	—	...	56 to 90
,, Hunter and Manning	,, ...	—	...	45 ,, 96
,, Metropolitan area	,, ...	—	...	68 ,, 91
,, South Coast	,, ...	52	to	97
,, Northern Tableland	,, ...	8	,,	66
,, Central Tableland	,,	43	,,	83
,, Southern Tableland	,, ...	0	,,	87
,, North-western Slope	,,	76	,,	51
,, Central-western Slope	,,	26	,,	12
,, South-western Slope	,, ...	7	,,	50
,, North-western Plain	,,	33	,,	18
,, Central-western Plain	,,	56	,,	43
,, Riverina	,,	190	,,	35
,, Western Division	,,	113	,,	81

The Winter of 1907. A Comparison with Previous Records.

The winter which has just ended has been a remarkable one, especially in our coastal districts, where the first month was unusually wet, and the latter two months abnormally dry. During June, the rainfall was generally above the average over the Eastern and Central Divisions, Barwon tributaries, and beyond the Darling, and below the average Riverina and north of the Lachlan. The greatest excesses during that month, amounting to over 100 per cent. above the average, occurred in the Far West and extreme North and extreme South Coastal parts. During July, only a few isolated patches, extending over the Lower Murray, Paroo, Barwon tributaries, and south-western slopes, received rainfall in excess of the average, whilst defects approaching 100 per cent. below normal extended generally over coastal districts and tablelands.

August shows a slight improvement upon the preceding month, the distribution being above the average beyond the Darling, over Western Riverina, Central-western plain, Central-western slopes, and upper Barwon tributaries, but great defects, approaching 100 per cent. below normal, again extended over the coastal districts and tablelands.

At Sydney the contrast between conditions during the opening month and the two succeeding ones has been sharply defined, June being the wettest on record for that month, while July and August have been the driest on record for those months. June

was the wettest on record, not so much from the total amount of rain—in fact, we have had several Junes with much heavier totals—but by reason of the greater number of continuous wet days, and also by reason of the high percentage of relative humidity present in the air. Assuming all days to be wet days upon which measurable quantities of rain have fallen, we had during June 24 out of 30 possible wet days. The previous highest record occurred during 1899, with 23 out of 30 possible wet days.

The relative humidity or moisture present in the air during June also exceeded all previous records. This element has been worked out from daily observations made at 9 a.m. The average for June was 89 per cent., saturation of course being 100 per cent. This may be compared with the average for the same month of all previous years for 48 years past, which comes out as 79 per cent. The closest approach to the very high relative humidity present during the greater part of that month occurred during the years 1897 and 1898, when the average for June was 87 per cent. in each of those years. The total measured rainfall at Sydney for June last was 914 points, being the greatest for that month since the year 1900, when 1,048 were registered.

Coming now to July results, we find a great contrast, the total rainfall for that month being only 37 points, while the average humidity was 77 per cent. Rain fell on only two days during this month, which is the lowest number on record, the previous lowest on record being four days, which occurred in July, 1862. The droughty conditions, which commenced with July last, became still more pronounced during August, only 29 points being registered during the latter month. A lesser amount than this was recorded only once before at Sydney, viz., in the year 1885, when only four points were measured. The extreme dryness during the month just ended is also shown by the average relative humidity, which comes out at 67 per cent., being 7·1 below normal, and the lowest on record since 1885, when it was only 64 per cent During August rain fell on only five days, which is the lowest number since 1880, when only two days were recorded.

Contrasting June with July and August, we find that the first month received 914 points, while the latter two months received a combined total of only 66 points, being the lowest on record for these months, extending over a period of forty-nine years. This amount may be compared with the previous lowest totals on record, as follows:—

	July.	August.	Totals
1858	·06	·79	·85
1871	·30	·47	·77
1880	·76	·61	1·37
1895	·35	·42	·77
1905	·39	·63	1·02
1907	·37	·29	·66

In order that the distribution of rainfall over the State as a whole for the recent winter may be seen, together with the normal for the same season, extending over the previous ten years, the following table has been prepared:—

	Sydney.	Grafton.	Moruya Heads	Armidale.	Katoomba.	Kiandra.	Moree.	Dubbo.	Wagga Wagga.	Hay.	Bourke.	Wentworth
June, 1907 ..	914	257	694	368	628	343	126	168	249	136	160	137
,, normal ...	435	195	315	231	472	1,061	167	169	247	169	81	135
July, 1907 ..	37	55	11	48	11	776	70	151	137	75	58	97
,, normal ...	576	308	322	234	626	800	173	171	205	148	82	89
August, 1907 .	29	74	42	139	70	567	183	155	147	129	64	80
,, normal .	473	185	386	216	461	699	156	196	174	116	128	112

Some Low Temperatures.

The comparative absence of moisture in the air during the latter two months of winter favoured the radiation of heat from the soil, and we have consequently had some very low temperatures. Frosts have been observed at Sydney on ten mornings, which is the highest number for ten years. The previous highest number for these months during the past decade was only four, which occurred in the years 1900, 1901, and 1906. Taking this State as a whole, the winter of 1895 has been hitherto regarded as one of the coldest on record. In order that the intensity of the winter that has just ended may be compared with the norma intensity for the same season extending over the previous ten

years, and also the results obtained during 1895, the following table has been compiled, showing the average readings derived from minimum self-registering thermometers placed under the shade at Sydney and other representative stations in this State :—

AVERAGE MINIMUM TEMPERATURE.

	Sydney.	Grafton.	Moruya Heads.	Armidale.	Katoomba.	Kiandra.	Moree.	Dubbo.	Wagga Wagga.	Hay.	Bourke.	Wentworth.
June, 1907 ...	48·9	43·7	44·9	39·7	39·1	26·7	43·8	38·1	36·9	35·8	40·7	34·3
June, normal	48·3	45·4	44·4	34·5	37·5	26·3	41·7	38·1	38·7	39·2	39·4	41·0
June, 1895 .	47·6	40·2	42·3	29·9	38·2	11·6	42·2	34·3	37·3	39·3	41·9	35·6
July, 1907	44·6	34·4	39·2	29·1	35·9	21·8	34·1	31·1	35·2	33·5	36·7	33·0
July, normal	46·0	40·7	40·4	31·6	34·9	21·9	39·1	34·6	36·2	36·6	36·6	37·7
July, 1895.... .	41·9	35·5	37·3	26·7	32·8	2·9	35·7	27·9	32·5	35·5	36·4	35·0
August, 1907	47·4	34·0	41·8	31·0	37·7	29·0	38·3	34·1	37·2	35·5	38·5	36·1
August, normal	47·5	44·2	41·9	34·3	36·2	24·4	42·3	35·8	36·8	38·1	39·5	39·5
August, 1895 ..	49·4	39·4	44·7	31·0	38·6	10·2	41·7	34·0	39·0	40·8	42·4	39·1

This table shows that the temperature has been abnormally low during the recent winter—in fact, lower at some stations than during the very severe winter of 1895. Comparing the average for the present winter with the 10-year normal in the table, we find that conditions at the two high-level stations (Katoomba and Kiandra) have not been so severe as down on the lowlands of Riverina extending towards Wentworth. It will be seen that the departures from normal become greater as we travel from Wagga Wagga to Wentworth. At the latter station, both June and July have been colder than the same months during any of the preceding 10 years, falling about 4 deg. below the extreme of the previous 10 years. Further north-west, towards Bourke, conditions have not been so intense, the results for both June and July being slightly above normal.

The foregoing details may be briefly summarised thus :—1. Useful rainfall, covering the greater part of this State, during June. 2. Abnormal dryness during July and August. 3. Abnormally low temperatures during winter, especially during the latter two months.

CAUSES.

Professor Abbe, when discussing the problem of seasonal forecasting, said : "I do not see how we can avoid the conclusion that a long-range prediction of the character of the seasons in any portion of the United States must also be fundamentally a prediction of the character of the winds that will blow over that region." And again : "A drought in New South Wales or the south-east side of Australia means a deficiency in the easterly winds blowing on that coast." These two remarks by an eminent American authority have been strongly supported by our experience in this State during the recent winter. There was a large easterly component in our prevailing winds during June, resulting in useful rainfall over the State. On the other hand, a large westerly component held sway during July and August, resulting in abnormal dryness. These elements are shown in the following table :—

PREVAILING WINDS.

1907.	Sydney.	Grafton.	Moruya Heads.	Armidale.	Katoomba.	Kiandra.	Moree.	Dubbo.	Wagga Wagga.	Hay.	Bourke.	Wentworth.
June.....	S.	S.	W.	E.	S.E.	S.E.	Variable	S.E.	E.	E.	S.W.	S.W.
July	W.	Variable	W.	W.	N.W.	N.W.	E.	S.	E.	Variable	—	N.W.
August ..	W.	W.	W.	W.	N.W.	N.W.	Variable	N.	S.W.	N.W.	S.	N.W.

Further, the total air movement from the westerly quadrant, as shown by the anemometer results at Sydney Observatory, gives a lesser mileage for June, but a greater for July and August, when compared with the normal for the same months during the preceding ten years, as follows :—

TOTAL MILES (WESTERLY).

June, 1907..........	3,758	July, normal........	4,975
June, normal.........	4,366	August, 1907	5,464
July, 1907..........	5,407	August, normal ...	3,699

During winter months the average sea surface temperatures off our east coast range from about 60 degrees in the south to 70 degrees in the north, which values may be contrasted with the mean air temperatures at certain coast stations as follows :—

	June.	July.	August.
Moruya Heads	54·4	51·6	52·6
Sydney	54·3	52·3	54·2
Grafton	57·9	54·9	58·2

The relatively warm ocean off our coast supplies a large amount of vapour, which is brought to us by easterly winds. On meeting the lower temperature along the coastline, condensation takes place, or the moisture-laden air is forced to climb our eastern slopes, by ascending air currents, whereby a rapid cooling takes place, and so causes further precipitation. On the other hand, westerly winds passing over our dry continental interior are unfavourable to rainfall. They are the outflow from the great masses of dry air forming the anticyclone which dominates our inland weather during the winter months. The latter condition, which is a more or less stagnant one, also explains the abnormally low temperatures experienced in the early morning during the past two months. Clear dry air favours radiation, so that the small amount of heat received by the soil during the daytime was soon lost during the night—the air then resting on the surface became chilled by contact.

HAWKESBURY AGRICULTURAL COLLEGE.

MONTHLY WEATHER REPORT.

SUMMARY for August, 1907.

Air Pressure (Barometer).			Shade Temperature.				Air Moisture Saturation = 100.			Evaporation (from Water Surface).			
Lowest.	Highest.	Mean.	Lowest.	Highest.	Mean.	Mean for 15 years.	Lowest.	Highest.	Mean.	Most in a Day.	Total for Month.	Monthly Mean for 9 years.	% of the year's Evaporation.
29·48 3.	30·28 18	29·99	27·0 18.	78·4 27.	52 24	51·56	43 29.	94 1.	66·2	·185 26.	2·769	2·171	6

Rainfall..	Points ..	16½	3	1	8	= 28½ points.	Mean rainfall for 15 years.
	Dates ...	3	4	7	21		195 points.

	N	NE	S	SW	W	NW
Wind ...	10	6	8	10	12	11

Greatest daily range of temperature 43·7°, on 16th.
Temperature fell below 42° on all days except 4, 8, 11, 14, 21, 27, 28, 29.
Frosts recorded on 1, 2, 15, 16, 18, 19, 20, 22, 23, 24, 25, 30, 31.

Remarks.—Rather a windy month, the wind coming generally from N.W.-S.W. The weather till remarkably dry, with rainfall much below the average, and the evaporation high.

W. MERVYN CARNE,
Observer.

Seasonable Notes.

GEO. L. SUTTON,
Wheat Experimentalist.

THE necessity for delaying the sowing of early varieties until the planting season is well advanced (as previously pointed out) is shown by the condition of such wheats growing in the blocks devoted to the trial of varieties at the Cowra Farm, at the present time, 13th September. These wheats were planted on 3rd April. Bunyip has flowered and was cut for hay on 4th September; Firbank is now in flower; Comeback, Early Jonathan, Florence, and Thew are in ear, and Steinwedel is fast coming into ear.

It is very evident that they are unseasonable. They come into ear very unevenly, and flower very irregularly. Planted early, these wheats mature too early either for grain or for hay. The cold frosty nights interfere with the formation of grain, and the cool short days are anything but ideal for hay making.

Though unseasonable when planted early in the season, as they were, for either grain or hay, their possibilities for ensilage making are great, for such work at this comparatively slack period of the year would be quite in order. Even Bunyip, which is the earliest variety tried, and which has a short straw, seems suitable for this purpose, for when cut on 4th September, its yield was at the rate of 7 tons 1 cwt. of green stuff per acre. It may be that in the making of ensilage from these quickly-maturing wheats, sown early, the problem of ridding dirty land from "Black oats" is to be solved, for these wheats can be planted so as to be at their best before the "Black oat" flowers, and if cut before that stage it will be prevented from reseeding, and a pest will be transformed into a palatable and nutritious food.

Report from the Commercial Agent.

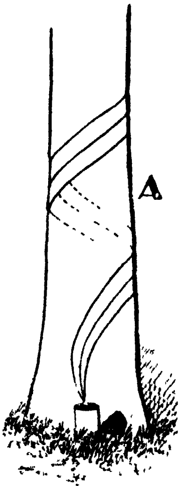
Para Rubber in the Straits Settlements.

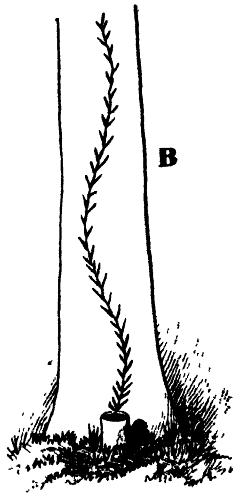
A Report on Para Rubber has been received from Mr. J. B. Suttor, Commissioner for New South Wales in the East, from which the following excerpts have been made :—

"In my despatch dealing with the Straits Settlements and the Federated Malay States, I mentioned the great activity now being displayed in connection with rubber plantations. I now have the honor to forward a more detailed report.

"On my recent visit to the Federated Malay States, I was much impressed with the great activity displayed in connection with rubber and other plantations in that country. Hitherto coffee and other trees engaged most attention, but of late years Para rubber has more and more come to the front, and to such an extent that a good rubber plantation is looked upon as a very profitable investment. It appears that about twenty or thirty years ago attention was first directed to the cultivation of rubber, but it is only during recent years that there has been such activity. To-day every available acre is being planted, and large companies are being formed for the cultivation of large estates. The tree known as the Para rubber is looked upon as the most profitable, and gives the best yield of No. 1 quality rubber. When the young trees are about 2 feet high, they are transplanted in rows, giving about 108 trees to the acre; although now, I am given to understand, it is a recognised custom to plant the trees at 25 feet intervals, or about sixty trees to the acre; the reason being that the trees closely planted are of more stunted growth than those placed at greater intervals. When once planted the young trees appear to require but little attention. The tree is of slender growth, with small branches, not unlike the growth of what is known as the river gum trees in Australia. When about five years old it is thought that they are capable of being tapped for rubber, although experienced planters prefer allowing the trees to stand until they are seven years old. It is estimated that when the trees are seven years old they yield a profit of £20 per acre; when fourteen years old, £80 per acre; and when twenty years old, £150 per acre. By a recent experiment, eighty-two trees, of an average age of fourteen years, were tapped for rubber, the result being over 330 lb. of rubber, or a shade over 4 lb. per tree. This rubber, sold on the London market, brought 5s. per lb., or equal to just 20s. per tree. With 108 trees to the acre, the return would be £108, or about £86 per acre clear profit, the cost of collecting and preparing being about 20 per cent., probably not so much.

"When the trees are ready for tapping, an incision is made in the bark with a sharp knife or other instrument, the cut being either a spiral one or what is known as the 'herring-bone' cut, as shown in the illustrations A and B.





Some prefer the former, others the latter. However, I am given to understand that the results are about equal in latex collected from the cuts. When the tree is cut as above, a small tin can, or any suitable vessel, is either tied or otherwise fastened to the tree into which the latex flows. Old tobacco and cigarette tins are admirable for this purpose, and in frequent use. After the latex is collected it is placed in what I take to be settlement pans, so as to bring about the precipitation of the rubber. A tree nineteen years old and 90 feet high has been known to yield 25 lb. at a single tapping. As the trees advance in age, the trunks at surface are not unlike Moreton Bay fig-trees in appearance, with numerous aerial roots. Some of the old trees, measured round the aerial roots at 3 feet from the surface, are from 80 to 90 feet in circumference."

To give an idea of what may be expected from rubber plantations, I beg to supply the following statistics: —

"In 1906 it was estimated that the world's consumption of rubber equalled about 70,000 tons, or 156,800,000 lb., which, at 5s. per lb. - the rate for 1906 - would be worth £39,200,000. During the last few years the consumption has increased at the rate of 10 per cent., so that it is not likely that the price of rubber is in danger of falling below a profitable figure. Although rubber is quoted at 5s. per lb. to day, it is estimated that at 2s. per lb. there is a handsome profit on any money invested in connection with plantations.

"As regards the probabilities of rubber growing in Australia, I feel confident that the plants will thrive in any country free from frosts, with rich soil and plenty of water. Water is the great consideration; at the same time, excessive rainfall has been known to considerably damage the trees. I certainly think that the trees would thrive, and prove a very profitable undertaking in New South Wales or Queensland, or in any rich soil that can be frequently watered. The experiment is well worthy of a trial, and now that regular steamers are running from Sydney to Singapore, it may be worth while to try the experiment of importing some of the young trees, or cultivating from seeds. I feel that any application made to the Government of the Straits Settlements, by letter addressed to the Hon. the Colonial Secretary, Singapore, would meet with prompt and courteous attention."

Orchard Notes.

W. J. ALLEN.

OCTOBER.

IT is some years now since our nurserymen have had such a run on stocks as they have had this year, and good early varieties of peaches such as Elbertas were sold out long before the planting season was half over, whilst for oranges the Valencia Late and Washington Navels have been largely sought after. The former is a particularly good variety for export, and the latter is always in demand in the winter, when it is found so difficult to place other varieties which are not usually at their best and sweetest until the warm weather of the spring sets in.

Fumigation.—Mr. Straughan, of Emu Plains, claims that he obtains best results by treating his trees in the month of August, as, during that month, there is no young growth to be damaged, and the tree is in perfect condition after such treatment for setting and carrying the prospective crop of fruit. He follows the table which I made up some few years back, and which can be had on application to the Department of Agriculture, Sydney. Mr. Straughan's orchard is at the present time the picture of health, and reflects credit on his system of working same.

Codling Moth.—As all growers are compelled to keep their orchards free of this pest, it may not be out of place to again give directions for using arsenite of soda alone and in conjunction with Bordeaux mixture.

Stock Solution.—1 lb. of best white arsenic (arsenious oxide) and 2 lb. of washing soda boiled in 1 gallon of water for from 20 to 30 minutes, or until the mixture is quite clear. Then add 1 pint of this stock solution to 40 gallons of water, to which has already been added from 6 to 8 lb. of best freshly slaked lime. If this latter precaution is neglected, the result will be serious damage to foliage. Some varieties of apples are much more tender than others: for these use the larger quantity of lime. The arsenic is much cheaper than Paris green, and when bought in quantities should not cost more than about one-third as much per pound. For this State, I am of opinion that at least four sprayings will be necessary to keep the moth in check.

If it is desired to add bluestone to the arsenite of soda solution, 3 lb. of bluestone may be dissolved in 1 gallon of hot water, by suspending the crystals on the surface of the water in a bag of open material, and when thoroughly dissolved can be made up to 20 gallons by the addition of more water. Now take 1 pint of the stock solution of arsenite of soda and dilute in 20 gallons of water in which from 6 to 8 lb. of freshly slaked lime has been added, and pour this into the bluestone mixture, thus making the whole up to 40 gallons. Strain before using.

In spraying, use as fine a nozzle as possible, the object being to cover the tree with a fine mist without any of the solution running off.

Bandaging.—It will be well to get the bandages on the trees towards the latter part of the month, and these should be removed and examined every ten days after the grubs have made their appearance, and all grubs and chrysalids destroyed by cutting them in halves with a sharp knife carried for the purpose.

Budding and Attending Dormant Buds and Grafts.—If the sap is well up citrus trees may be successfully budded this month. Keep all dormant buds and grafts well disbudded, so that the bud may get away good and strong. No suckers or shoots should be allowed to grow below the buds. It is also very essential that stocks should be cut back properly. The cut should be slanting, being slightly lower on the side opposite to the bud, and it is advisable to stake them, not only to prevent their being blown out, but to encourage a straight trunk.

Where grafts have been put in old trees, they are even more liable to be blown off than small ones, and must be tied to prevent it. To do this a good stake should be tied to the branch grafted, and allowed to project a foot or more over the end; then as the graft grows it can be tied to it.

Care of Newly Planted Vines and Trees.—Keep all vines well disbudded. I have noticed in many small vineyards that this important work is neglected. Never allow any branch to grow below the crown of the vine. To do the work properly, it will be necessary to disbud all vines from two to three times.

Keep a strict watch on all refills, and if these show any signs of wilting give them one or two buckets of water from time to time until they get a good start.

Disbud all newly-planted trees, leaving good shoots at least four inches apart along the trunk of the tree, and do not allow two or three shoots to start from the same place, as so many have done, but give each branch a separate hold of the main stem.

Borers.—While working around trees watch for borers on the trunks and branches, as it is very easy when they are just starting their work to cut away the bark and find them—in this way keeping the orchard free of this pest.

As soon as the vines begin to grow, sulphur them at least once before blooming, for mildew, and twice if the weather is very damp. In coastal districts it is well to spray them, immediately after the fruit is set, with Bordeaux mixture, and should caterpillars of any kind be eating the leaves, add to the solution arsenite of soda as given above. Repeat the sulphuring from time to time, giving as many as eight applications, if the season is at all damp. This will pretty well keep the oidium in check.

Growers should see that the orchards are cleaned up as early as possible and the soil worked up to a good depth and cleaned of all weeds, so that any moisture in the soil may be conserved for the sole use of the trees and fruit.

Mr. J. F. Moody, manager of the Kameruka Estate orchard, informs me that the Sturmer pippin is one of the best varieties he has growing there, as

it carries good crops, the fruit keeps well, and after being kept for a time develops into a splendid dessert apple.

Mr. Joseph Cox, of Bathurst, has among his collection of apples one called the "Senator," which he claims is about the best he is growing. I have to

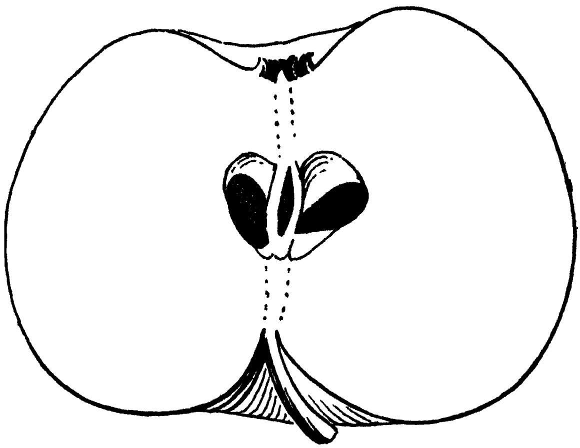


Fig. I.—Section of Senator Apple.

thank him for sending me a sample, which is shown in Figs. I and II. The following is Mr. Cox's description of the apple :—

Very fine large fruit; flesh, yellowish white, stained with pink. Late keeper and very fine flavour—one of the best. Diameter of apple, about 3 inches. Starts to bear about the sixth year after planting. A very heavy bearer and carries its fruit well on the main branches, adapted to bearing great weight. It colours well, and ready to pick the second week in March.

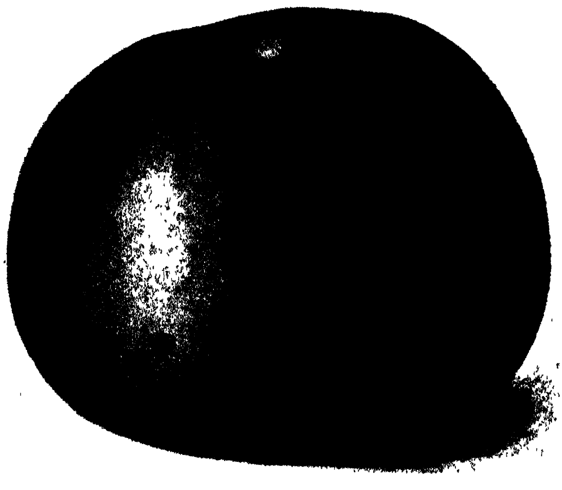


Fig. II.—Senator Apple.

Practical Vegetable and Flower Growing.

W. S. CAMPBELL.

Directions for the Month of October.

Vegetables.

If the season should be a satisfactory one with respect to a sufficiency of rain, this month should be one of the best of the year for the production of vegetables and for sowing and planting. The growth of everything should by this time be all that can be desired, with the exception of weeds of many kinds, which must be kept in subjection, or in many cases they will destroy seedlings in a short space of time. Young onions and carrots are liable to be smothered by weeds, therefore constant attention will be necessary whilst those plants are young and tender.

At time of writing the weather is extremely dry over a very large area of the State, and unless a change occurs soon it would not be advisable to sow or plant extensively any kinds of vegetables, unless the supply of available water is sufficiently abundant for irrigating. Deep digging and the use of large quantities of farm-yard manure will assist more than anything else to conserve water in the soil.

Bean, Kidney or French.—Any varieties of this class of bean may be sown extensively almost anywhere in the State during the month. There are many varieties obtainable—dwarf, runner, butter, and so on—and it would be as well to try several varieties, for they differ a good deal in flavour and in other qualities.

Bean, Lima.—This is another kind of bean altogether, for the seeds are used just as broad beans are. One of the best of the numerous varieties is King of the Garden, which bears plentifully. Sow during the month.

Beet, Red.—Sow in drills, 18 inches apart, sufficient seed to keep up a supply during the month. Try the Globe, as they are the most satisfactory to grow.

Beet, Silver.—Seedlings already raised may be planted out in the garden. Not many plants are likely to be required at a time. This is a useful vegetable for summer use, and one that will withstand a good deal of dry weather.

Cabbage.—Sow a little seed occasionally during the month in order to have a sufficient number of plants to meet requirements. Prick out seedlings that are large enough to move, and plant in the garden any well-grown pricked-out plants that are ready for removal. For the cabbage use abundance of manure, and during its growth keep it well cultivated by surface hoeings.

Cauliflower.—Sow seed, prick out seedlings, and plant and treat as advised for the cabbage. The cool districts will be found the most suitable places for the cauliflower during the summer.

Carrot.—Sow seed as largely as may be required from time to time during the month. Sow in drills from 1 foot to 18 inches apart, and thin out the carrots well as soon as the plants are thoroughly established.

Celery.—Seedlings large enough to plant should be set out in shallow trenches to meet requirements. Sow a pinch or so of seed in order to have a little stock of plants on hand. Celery will need a good deal of moisture during its growth, and if the weather should be dry the plants should be well watered during their growth.

Celeriac, or Turnip-rooted Celery.—This is a variety of the above, but may be grown more like a turnip. This needs good rich soil and abundance of moisture.

Cucumber.—Seed may be sown largely, except in quite cold localities where late frosts may still occur. Use abundance of farm-yard manure, unless the soil is already rich enough naturally for this vegetable.

Cress and Mustard.—Sow a little seed occasionally during the month.

Capsicum or Chilli.—A plant or two should suffice for an ordinary garden, unless it be desired to try varieties, of which there are many, from the hot small-fruiting variety to the enormous quite mild kinds, used chiefly for ornamental purposes. Seeds may be sown and seedlings planted out as soon as they are large enough to move.

Egg-plant.—This vegetable is but little used here except for ornamental purposes, for which several varieties are well suited. Seed may be sown and seedlings planted out in vegetable garden.

Kohl Rabi.—Sow a few seeds and plant out seedlings. Probably very few plants will be required, for this vegetable is not very much cared for in this State. Treat much as you would a cabbage in cultivation.

Leek.—Sow seed in seed-bed, and transplant seedlings when large enough. The soil should be made quite rich with abundance of manure for the leek, which is a greedy feeder. Abundance of water will also be necessary should the weather prove dry. Plant out, rather deep, the young leeks in shallow trenches. When the plants are well grown blanch the stems, like celery.

Lettuce.—Sow seed in the garden in drills, and thin out seedlings when they have made good growth. Transplanting at this time of year is risky, for transplanted lettuces are liable to bolt or run to seed. Manure well, and water well if the weather is dry.

Melon, Rock and Water.—Sow seeds largely, and manage as advised for cucumber.

Okra.—Sow seed in seed-bed, or transplant seedlings that have already been raised.

Onion.—Sow a little seed during the month, and cultivate well plants already raised. A dressing of soot and salt (half and half) should prove useful.

Parsnip.—Sow sufficient seed in rows about 2 feet apart to keep up a supply during the month.

Potato.—Plant out a few rows of medium-sized whole potatoes. Be careful to select seed free from scab, eel worm, potato moth, or any defects.

Pumpkin.—Sow a few seeds of best variety procurable. Should the soil be of poor quality, use a heavy dressing of farm-yard manure. Sow four to six seeds in clumps about 6 to 8 feet apart, and thin out plants to two or three when they have made the second leaves.

Radish.—Sow a little seed from time to time to keep up a good fresh supply of tender radishes. Use abundance of well-rotted manure, or, better still, grow the radishes on land that had been heavily manured for other vegetables.

Peas.—A row or two may be sown in cool districts. It will be too warm and dry for success with these in other districts.

Rhubarb.—If seedling plants are required for planting out next early spring, some seeds may be sown during this month.

Sweet Potatoes.—Rooted cuttings should be planted out in any district where this useful vegetable is likely to grow.

Tomato.—Seedlings should be ready in all districts by this time for planting out. Train the plants to one stem only by pinching out all side shoots as they appear. When planting, drive in a stout stake for the support of each plant. Seeds may be sown from time to time should any more seedlings be needed.

Turnip.—Sow a little seed in drills in well-manured ground. Thin out seedlings well, or the turnips will grow all to top.

Vegetable Marrow and Squash.—Sow seeds freely, and treat as advised for cucumbers, pumpkins, &c.

Flowers.

During October numbers of beautiful flowers should be ornamenting the garden, and chief amongst them are the roses, for during this month they should be seen in the greatest perfection. Dry weather, however, is by no means favourable for roses, and if the rain keeps off during the month the flowers are unlikely to be satisfactory, unless the plants can be irrigated.

Chrysanthemums and dahlias may both be planted during the month. The former, if grown for large show flowers, will need particular attention as it grows. It should be grown to one stem only, and all suckers should be removed as soon as they appear above ground. The plants will need water frequently and liquid manure occasionally.

The dahlia should be grown to one stem only, and any suckers which may appear should be removed. Being a heavy brittle plant, it will need the support of a stake or two, which had better be provided at time of planting. Water is essential in dry weather, and growth will be improved by occasional applications of liquid manure.

Seeds of tender and half-hardy annuals may be planted during the month, and as soon as seedlings are ready they can be planted, but protection and water will probably be necessary.

D

Farm Notes.

Hawkesbury District—October.

H. W. POTTS.

The outlook for the spring crops and for the growth of fodder is the gloomiest we have experienced since the record year of drought in 1902. The July rainfall was the shortest known at the College in one month, viz., 6½ points; August and September were practically rainless months. This, taken into consideration with the fact that the subsoils have not been moistened for three years, renders farming operations extremely difficult to control, and intensifies the need for cultivating only such plants that possess drought and heat-resistant qualities.

The stock so far have experienced no check, but have been fed largely on ensilage. The dairy stock and sheep have benefited, and continue to demonstrate the great value of this method of providing against periods of scarcity. In this district dairy farmers have been slow to realise this in the past. The cost of construction of silos, however, has been reduced of late years, the methods of filling and conserving are now better understood, and a general feeling of confidence is being aroused in its favour.

It is not probable that we will have late frosts; in any case, it will be essential this month to put forward every effort to meet the almost total loss which is facing us in the spring crops by sowing early summer crops for green feed. This may be considered the busiest month of the year.

Maize.—The main crops may be planted. For all classes of stock, either as green feed or ensilage, maize and sorghum should be considered our chief crops. They furnish more food per acre than any other plant, and can be sown continuously for the next three months. Maize may with advantage occupy ground previously cropped with legumes, wheat, rye, barley, or rape. Deep loamy soils overlying a clay subsoil give the best results; but it should be remembered, with the prospect before us of a dry season, that light sandy loams gave good results during the last drought, provided there was a reasonable percentage of humus or organic matter in them. As a rule these sandy soils retain moisture well under adverse conditions, and are easily kept cultivated. In the first instance, deep ploughing is advised, with harrowing and rolling to ensure a fine tilth on the surface. After light showers or thunderstorms these light soils are maintained in good mechanical condition at least cost. By keeping the surface fine and loose, evaporation is checked, and the plant receives the full benefit of the moisture.

It will be judicious to recall past experience under similar trying circumstances in the matter of drill planting *v.* check planting. By the latter it is meant planting several grains together in the drill at regular intervals; and by drill planting, single grains planted in a drill, but closer together than in the case of check planting.

The results were in favour of drill planting. Thinly-sown crops should give the best returns where the moisture is scanty, by reducing the number of feeding roots, and thus affording a greater allowance to each plant.

Again, in the matter of trench planting—*i.e.*, planting at the bottom of a furrow—*v.* level planting, tests resulted in favour of trench planting, whether the crop is subsequently hilled or cultivated on the flat. The practice of hilling a maize crop is one for consideration, also, at this juncture, when moisture is a matter of consideration. With hilling there is a greater loss in evaporation, and by flat cultivation the area exposed to this loss is minimised and the best results secured.

Where manure is required, it is recommended that a fertiliser, composed of five parts superphosphate, two parts sulphate of potash, and one part dried blood, be drilled in—about 2 cwt. to the acre.

The best varieties for green fodder and quickly maturing are—Hickory King, Red Hogan, Improved Early Mastodon, Abercrombie. For grain the following may be selected:—Pride of the North, Red Hogan, Riley's Favourite, Iowa Silvermine, Clarke's Mastodon, Golden Beauty, Yellow Hogan, Star Leaming, Longfellow, Dent, and Abercrombie.

Sorghum.—In point of food value this crop may be considered next to maize. It will thrive on land too poor for maize, but the soil should be well cultivated, of fine tilth, clean, and mellow. It is a crop essentially suited for conditions when properly cared for in the early stages of its growth. In contrast with maize, sorghum is more delicate when young, but once full-root action is established it becomes hardier and will resist both drought and frost better. Seed should be sown in drills 3 feet apart, from 7 lb. to 10 lb. to the acre. Equal parts of bonedust and superphosphate or Shirley's No. 1 is a good fertiliser, applied at the rate of 1 cwt. to the acre.

A Champion wheat drill may be employed, by leaving three tubes open in the thirteen for seed and using the other ten for distributing the fertiliser.

Owing to the smallness of the seed and the slow early growth of the plant more attention must be paid to keeping the land free from weeds, and conserving moisture. "Care must be directed to the young plant, and avoid smothering it whilst keeping the weeds down. The number of plants per acre should be double that of maize."

The hardiest and best drought-resisting varieties are *Sorghum saccharatum* and Planters' Friend—one of the Imphees. Early Amber Cane is also a good sort. This crop is equally useful for horses, cattle, sheep, and pigs, during the hot weather, as green feed. It will produce green forage later into the winter month than any other. We have grown it up to

20 tons to the acre. It is next to maize in providing the cheapest and most easily handled crop for ensilage.

Millets.—Two varieties may be considered suitable for this district, under the dry conditions prevailing.

Our past experience points to the sowing of White French for quick returns. In 1902 a crop of green fodder was taken in sixty-five days. The crop averaged 10 tons to the acre in the green stage, and about 3 tons hay.

This variety is valued for its quick growth. The Hungarian takes thirty days longer to mature.

All the millets respond freely to rich soil and manuring; but it is surprising the yields that may be got from comparatively poor sandy loams.

In the absence of farm-yard manure, it is advisable to stimulate the surface soil with a fertiliser of equal parts bonedust and superphosphates, 1 cwt. to the acre.

The seed is usually sown broadcast, 7 lb. to the acre. Exceptionally low-class land will take up to 12 and 15 lb. to the acre.

Drilling is better, in so far that the young plants are better protected, and cultivation can be followed up after germination.

Few fodders repay better the attention given to millets. They are palatable and nutritious, and, apart from its use as a green fodder, it has been found to be eminently suitable to conserve as stack ensilage. Should the rainfall be favourable, a second crop can be taken off in the season.

Cowpeas.—We again turn to this excellent plant in a dry season to help us over a bad time. Apart from the pre-eminence this plant occupies as a soil renovator in the rotation, we recognise in the cowpea crop a class of fodder which is of great service at a time when succulent feed is difficult to grow.

We know its power to thrive on poor soils under the most adverse circumstances, and its relishable and nutritious character as a pasture and fodder plant in the hot weather for horses, cattle, sheep, and pigs. It is one of those crops which takes the place of the fallow, with distinct gain to the soil between two main crops. A fine seed-bed, well cultivated, is needed, with the addition of a fertiliser. The following may be selected:—

Bonedust	150 lb.
Superphosphate	600 lb.
Sulphate of Potash	400 lb.

Apply 3 cwt. to the acre. The seed may be sown in drills, about 8 to 12 lb. to the acre, according to the variety. The soil should be warm; it is a mistake to plant whilst any chance of late frosts exists. The drills should be 3 feet apart, and the seed be covered 2 inches.

Cultivation should be carried out once a fortnight.

The best varieties are Upright, Black, Clay Coloured, Warner's Hybrid, Whip-poor-Will, White, Chinese Mottled, and Red Ripper.

Pumpkins, Marrows, Squashes, Melons.—Pumpkins are yearly increasing in popularity as a succulent stock food. Cut up and fed to cows they will provide an agreeable change to a silage ration, although not so nourishing. It requires 2½ tons of pumpkins to equal the nutritive value of 1 ton of maize silage.

With pigs we find pumpkins, marrows, and squashes form a most appetising and agreeable class of food, especially when faced with bare paddocks and an absence of green fodder.

True Ironbark pumpkins yield the best results. They possess good flavour, sound texture, and are especially noted for their good-keeping qualities.

The Pot-iron squash frequently weighs up to 70 lb., and is worth cultivating; also the Crown, Rio, and King of the Mammoths.

In the marrow class, we may mention Long White Bush and Moore's Cream as being worthy of cultivation.

Mangolds and Sugar Beets.—These useful root crops may be sown during the early part of October. The Mammoth Long Red Mangold is a certain cropper in rich deep soil. In shallow, light sandy soils the Yellow Globe is the most profitable.

From 5 to 6 lb. of seed to the acre is sufficient of either variety.

For cattle and pigs mangolds afford a nourishing and tasty class of food.

Lucerne.—The opportunity for putting in the latest sowing of lucerne should not be forgotten, provided there be sufficient moisture.

Sweet Potato (Impomœa batatas).—This large tuberous-rooted perennial demands more attention and consideration than is given to it. As an article of diet it has much to commend it; this is quite apart from its place in the pig food. It is wholesome, palatable, and nutritious.

Light sandy and loamy soils are indicated for heavy yields. The flavour and condition of the tuber is enhanced by dry hot summers. The soils should be well cultivated and reduced to a fine condition. When the plants are 3 or 4 inches high, sturdy and well grown, they should be dipped in a creamy paste of cow manure and planted out 15 inches apart. The best fertiliser is potash with superphosphate.

Grasses.—Where there is sufficient moisture available, then the *Paspalum dilatatum* may be sown in quantity. It may, however, be pointed out that this grass does not respond in the presence of dry weather.

The Rhodes Grass (*Chloris Gayana*, var.) has many points in its favour. It resists drought very well, and gives a good stand of rich tasty grass all through the summer. Dry, hot seasons suits this grass best. As soon as all risk of frosts is over, then this should be sown.

Sheep's Burnet.

During the prevalence of the last drought Sheep's Burnet established a reputation as a drought resister.

It is a hardy perennial plant, which when established lasts several years without resowing. Soils which will grow maize are well suited for its growth; in fact, its deep roots enable it to thrive in almost any class of soil. It will do well in heavy clay or in light sandy soils. It is very hardy, and will give good yields of fodder when the weather is too dry for most crops.

The seed should be sown in drills or broadcast. If it is drilled, 4 to 5 lb. of seed should be used, and the drills made about 18 inches apart. From 10 to 12 lb. of seed will be needed for broadcasting. It can be sown in either spring or autumn. The same danger of failure from dry weather or weeds exists as in the case of lucerne, and some care is necessary while the plants are young. Unless the winter is exceptionally dry a good stand can usually be obtained in the autumn if the ground is thoroughly worked for some time previous to sowing. A deep ploughing should be given about the beginning of January, and the soil kept loose on the surface by lightly harrowing occasionally until April or May, when the sowing should be done. By following this method, although the season may appear dry, it is surprising the amount of moisture that can be conserved in the soil. If the ground is lightly ploughed just before sowing, to loosen the surface and bring up moist soil, the seed will generally germinate well and grow during the winter.

If spring sowing is necessary, and the ground is not clean, the best method to adopt is to lightly plough the ground late in the winter to cover the weed seeds and get them to germinate. When they begin to show through the surface a light harrowing should be given to root them out. If this is done once or twice the ground will be got fairly clean. It may make the sowing a little late, but a better stand will be obtained and there will be less danger of failure. The soil should not be ploughed again, as this will bring other weed seeds to the surface, where they will germinate.

The first favourable chance should then be taken to get the Sheep's Burnet into the ground. It should be sown shallow, and if possible whilst the weather is moist. After it has come up, if weeds begin to grow they should be kept down by running a mower over the ground occasionally. This will keep the weeds in check, but will not affect the crop. After it has become well established no further trouble will be found with weeds.

The crop will last a number of years, and can be cut several times during the year. The cutting can be done either with a mower or reaper and binder. Instead of cutting it can be fed off; but if this practice is followed it should not be grazed too closely, or it will be eaten right out.

Glen Innes District—October.

R. H. GENNYS.

Frosts should now be over, therefore a number of vegetables may be planted—such as melons, pumpkins, squashes, beans, cucumbers, &c.

Preserving Melons.—Triamble and Citron are amongst the best, and are good keepers, especially the latter.

Squashes.—The Hubbard squash for keeping through the winter and for genuine eating qualities is hard to beat, and does well in this district. Other squashes that are much fancied here are the Long Fish and Custard varieties. Both grow well under favourable weather conditions.

Pumpkins.—Crown, Silver Nugget, and Ironbark are all eating sorts and good keepers: Crown and Ironbark especially so.

Cabbages may still be planted; also *carrots* and *parsnips.*

Asparagus.—Raising from seed is very slow, and it is recommended putting in plants one or two years' old.

Celery and *White Turnips* may also be planted. *French Beans* and all varieties susceptible to frosts may be sown. To grow vegetables successfully, soil must be worked deeply, manured plentifully, and surface kept well worked to check weeds and conserve moisture. Water must be used in dry weather for most garden vegetables.

Maize may now be planted, this being the best month generally for New England. Only early-maturing varieties have much chance of ripening properly in our short season. If sown after the plough in land inclined to be wet, plant seed half-way up the furrow slice instead of at the very bottom of the furrow; if heavy rain occurs after planting, much seed is rotted lying in the bottom, especially in stiff clay land. The young plant can root more easily and go downward, if it has some loose earth underneath it.

Varieties that have done well here are Iowa Silvermine, Pride of the North, Riley's Favourite.

Millets for hay.—Hungarian and New Siberian are two of the best, and White Italian for broom-making; all do well here.

Sorghums.—Amber Cane and Planters' Friend; two excellent sorts for green feed and ensilage.

Cowpeas.—Black Cowpea does the best in this district.

Field Peas.—Partridge and Suntop are two good varieties.

Potatoes.—Nearly sixty varieties were on trial here this season, some of which did very well, while others gave poor results. In the latter, in some cases no doubt this was partly due to the seed, which was of poor quality and size; and it cannot be too strongly impressed upon growers to use nothing but large, sound seed. In the cases above referred to, chiefly new varieties, no other seed was available.

Whole potatoes for planting are generally advised, in preference to cut sets. Good strong shoots are wanted, with plenty of food to sustain them until they get well rooted.

Scabby potatoes should not be planted, and land that has produced scabby potatoes last year should on no account be sown with potatoes this year, but either spelled or used for some other crop.

For the prevention of Potato Scab the following treatment is recommended :—Make a solution of 1 oz. of commercial formalin (liquid) to 2 gallons of water. Soak the seed for about two hours, then cut and plant in the usual manner.

The following is a list of potatoes that have yielded the best this year—only those that yielded over 4 tons to the acre are given :—Anderson's Royalty, a Kidney variety, easily heads the list with a good yield of 13 tons 16 cwt. 24 lb. per acre; Anderson's Satisfaction next, with 8 tons 18 cwt. 3 qrs. per acre, a splendid potato in every way. Other potatoes yielding at the rate of between 8 and 9 tons to the acre are Irish Flounder and Cambridge Kidney; those yielding between 6 and 7 tons are Ashleaf Kidney, Parson's Seedling, British Queen, Sir Walter Raleigh, State of Maine, Early Thoroughbred, Burbanks; those between 5 and 6 tons are Red Russet, Coronation, Country Boy; those between 4 and 5 tons are Early Rose, Aroostook, Brownell's Beauty, English Pink, Early Puritan, Evergood, and Carman No. 3.

It might be mentioned that Brownell's Beauty was grown on very stiff soil, which no doubt interfered with the development of the tubers. With the exception of it and Manhattan, the tubers were grown under similar conditions; but there was too much clay in the soil for it to be termed good potato land. Further information as to other varieties will be given later on.

From three years' trials, I have found the following potatoes all round to be the best for this district, viz. :—Brownell's Beauty, Satisfaction, Irish Flounder, Cambridge Kidney, and Manhattan.

Northern River Districts—October.

A. H. HAYWOOD,
Acting Manager, Wollongbar Experimental Farm.

During the months July and August only 2·24 inches of rain were recorded, and for September, up to date (14th), no rain has fallen, consequently the early-planted crops are very backward.

Sugar-cane.—The value of cane as a fodder for dairy stock seems to be much under-estimated by dairymen. To my mind, an area of cane would be an acquisition to every dairyman—that is, in the cane-growing belt.

Cane, when once established, provides a green succulent fodder relished by stock, which is available all the year round, and will last in good soil a long period without replanting.

These qualities are not embraced in any other fodder crop. Mr. Guthrie, of the Department of Agriculture, in his analysis of sugar-cane gives the albuminoid ratio as follows:—

Sugar-cane	1 to 30
Tops	1 to 9
Mixture of half cane and half tops	1 to 15

The analysis clearly shows that cane by itself is not a milk producer, being too wide a ration, but will fatten. It should be fed in combination with other food containing a high percentage of protein—such as bran, lucerne, clover, cowpea, &c.

Care should be taken in selecting suitable varieties for feeding. Out of over 100 varieties experimented with on this farm, only a very limited number are to be recommended. Two of the varieties that can be recommended are Di Di Rufi and Striped Isaacs.

Before chaffing or feeding out whole the dead flags should be pulled off, and not fed, as they are very indigestible. When the cane is not chaffed, slender varieties should be selected.

The objectionable taint in milk noticed when cows are fed on cane can be obviated by feeding it immediately after milking. The sets should be planted 4 feet apart in the drill, drills 5 feet apart. Cuttings may now be planted.

Sweet Potatoes.—Cuttings may be planted this month, choosing, if possible, showery weather. The methods of propagation in vogue here are by—(1) young shoots from the tubers; (2) cuttings from vines; (3) small tubers. The first or second method is preferable.

Planting on hills I do not advocate in this climate. Better to strike out furrows 30 inches to 3 feet apart; the shoot or cutting is then pushed in on the side of the furrow, 15 inches apart in furrow, a few inches out of the ground; a furrow is then ploughed over.

When this crop is attempted on the partially-exhausted soils of this locality previous preparation of the soil is necessary—as the loosing up of the subsoil, and the growing and ploughing in of some suitable green manure, as cowpeas, rape, clover, or field peas. It is necessary to look ahead before planting any crop here. The poor yield of all crops in the Big Scrub soils is accounted for mainly by the physical condition of the soil: there is a great deficiency of organic matter in this soil, which is very apparent in the soils that have been under crop some years,

In the Sweet Potato the dairyman has a great source of revenue. We have no more economic crop for pig raising and fattening; and is valuable for a change to cattle, stud bulls, &c. It is a remarkable yielder here (6 to 8 tons per acre) under ordinary cultivation.

When planted in October the farmer has a supply of tubers for pigs from March to September the following year, which can easily be supplemented by other home-grown products—as maize, artichoke, skim milk, cane. The best variety for feeding is the White Maltese.

Maize may be largely sown this month for grain, ensilage, and fodder. Previous preparation of the soil should have been made, as in the above crops. ... ...

For grain, plant with corn-drill in rows 4 feet apart and 1 foot to 16 inches in the drill. For fodder, plant 3 feet apart, and twice as thick as for grain, so as to choke the ears down to about half size; this will give more nutrients per acre with maize than any other system tried. The same applies to maize for ensilage.

Varieties for grain.—Iowa Silvermine, Golden King, Leaming, and Moruya seed maize.

For ensilage.—Hickory King, Mastodon.

Early-maturing varieties.—Iowa Silvermine, Early Leaming, Pride of the North.

In maize growing the following points must be rigidly observed:—

(1) Selection of seed; (2) supply of organic matter to soil; (3) the conservation of moisture by creating a surface-soil mulch by means of frequent shallow cultivation; (4) the use of a suitable fertiliser: in bonedust we have a very safe one, rate of 2 to 3 cwt. per acre; but in some cases require a complete manure.

Cowpeas may be sown, mainly as a renovator of partially worn-out soils. For this purpose they should be sown broadcast, at the rate of 45 lb. per acre, and ploughed under when the pods are in the green stage. When grown for seed plant in drills 3 feet apart and 1 foot in the drill, and sow 10 to 12 lb. per acre. The Black is the best all-round variety. I have had successful results with planting cowpeas with maize. After the maize is up 2 feet high, plant cowpeas close to the corn drill with corn-dropper. The vines creep up the maize stalk, and thus provide a valuable combination either for ensilage or fodder.

Jerusalem Artichokes.—For the pig-raiser this is a valuable crop. As a food it is a flesh former, and a splendid yielder. Sow in drills 3 feet 6 inches apart and 18 inches in the drills and 6 inches deep.

Sorghums should be sown for seed and for fodder. Varieties—Amber-cane and Planters' Friend. For fodder, I advocate sowing broadcast. For ensilage, maize is preferable For seed, in drills 3 feet apart; rate, 10 lb. per acre.

Teosinte.—Those who have not tried this fodder crop should reserve a small area for planting next month, or it may be planted in a warm situation now.

Melons, Pumpkins, &c.—Those now up will have to be closely watched, and applications of unslacked lime applied to and under the leaves to protect from fungus and insect pests.

Banana and Pineapple suckers may be planted out.

It is not yet too late to clean up portions of pastures littered with logs and stumps, so as to have a clear field for the working of the mowing machine in the coming paspalum crop. How necessary this cutting is for the after results is now generally recognised, but seldom done. Paspalum hay is not to be despised, and in the form of ensilage it has few rivals, and is gaining many advocates. Another economical operation may yet be performed before the full growth of grass prevents it: that is, after the first showery day run the harrows (reversed) over the dried cow-droppings, so as to break them into small particles, which go to form in part a mulch and supply plant food, which, if left, is unassimilable for many months.

Rhubarb Cultivation.

F. C. KING,
Gardener, Wollongbar Experimental Farm.

The method of growing rhubarb adopted at the farm was, in the first place, to thoroughly trench to the depth of 3 feet, but the bottom of the trench was only broken up to the depth of 12 inches with the digging fork, and allowed to remain at the bottom of the trench, for it is a great mistake to bring such soil to the surface. The top surface was turned over and the manure placed on the top, whilst the second or middle soil was turned on the top of the manure, and completed the trench. The manure used was horse, cow, sheep, pig, and the waste from the ensilage stack. After the ground had settled, the crowns were planted on the 20th of August, 1906, setting the crowns 4 feet apart each way, which is quite close enough when the rhubarb grows freely. The bed is 40 yards long by 11 yards wide. Eighteen loads of the above manures were used to complete the bed. The first bunch was pulled on the 30th October, 1906, and a permanent supply has been maintained of excellent quality up to the present, whilst no less than 1,524 lb. of rhubarb has been pulled and used in various ways. The varieties are Crimson Winter, Giant, Hogan's Shillelagh, and Winter.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Sub-Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1907.

Society.	Secretary.	Date.
Wyalong District P., A., H., and I. Association ...	S. G. Isaacs ...	Oct. 1, 2
Adelong P. and A. Association...	H. King	" 15, 16
Bega A., P., and H. Society	W. A. Zingell ...	" 23

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Berry Agricultural Association...	A. J. Colley ...	" 21, 22, 23
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[1 Plate.]

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Agricultural Gazette of New South Wales.

Forestry.

SOME PRACTICAL NOTES ON FORESTRY SUITABLE FOR NEW SOUTH WALES.

[Continued from page 731.]

J. H. MAIDEN,
Government Botanist and Director of the Botanic Gardens, Sydney.

XVII—*continued.*

Conifers.

VI.

4. **Thuia** (including *Thujopsis*)—often spelt Thuja.

"The Thuias, with one exception, *T. gigantea*, are medium-sized or low evergreen trees of narrowly conical outline; or dense globose, fastigiate, or dwarf shrubs that have deviated under cultivation from the ordinary habit of the species. As here understood, the genus includes five species inhabiting a belt in the north temperate zone, extending with interruptions through North America and Asia, between the 30th and 50th parallels of north latitude."—(Veitch's Manual.)

(1.) *T. dolobrata*, L.f. The "Akeki" of Japan.

A tree or undershrub used as an avenue tree in China and Japan. The wood is very durable, and is used for many purposes; the bast is made into ropes.

It is scarcely suitable for a dry climate, as it is liable to die suddenly during a spell of warm, dry weather.

L 2 a (Sydney Botanic Gardens).

(2.) *T. gigantea*, Nuttall. "Western Arbor Vitæ; the Red or Canoe Cedar of Oregon."

The tallest of all the Thuias, attaining a height in its native country (British Columbia, northern California, &c.) of 200 feet. It flourishes best in rich river valleys.

It is a very handsome species, and it yields a valuable fissile timber. It certainly ought to be added to the number of the Conifers to be planted as extensively as convenient in the colder parts of New South Wales.

We have had it in the Sydney Botanic Gardens from time to time, but it does not last in the Sydney climate.

Thuja dolobrata, L.f.
Botanic Gardens, Sydney.

(3.) *T. occidentalis*, L. "Arbor Vitæ." Called White Cedar in the United States and Canada.

It is a tree of medium size, very common in swamp land in Canada and the north-eastern United States. Like other Conifers, it varies much in size according to soil and climate.

It is, probably, the first American Conifer introduced into Great Britain and is a most useful plant, although it has had to submit to the competition of many Conifers from different parts of the world.

Its leaves have been used as a remedy for rheumatism on account of their sudorific properties. Its wood is used for posts and similar purposes, on account of its durability. It forms a fine hedge.

Leaves used in the manufacture of Cedar-leaf oil, according to Schimmel.

It does indifferently well in Sydney.

It is a very variable species, and a large number of forms of it have been named.

var. *aurea* ; var. *variegata*.

U 8 b, L 35 b (Sydney Botanic Gardens).

var. *plicata*, L 11 a, 26 c, 30 a.

(4.) *T orientalis*, L. "Chinese Arbor-Vitæ."

This is a low tree of columnar or pyramidal habit, often a dense shrub of broadly conical or globose outline.

It is very variable, and many different forms have received special names.

Its geographical range is somewhat uncertain; it probably extends from northern China to Persia.

L 7.

var. *aurea*, U 6, L 13, 29 c, 34 a.

var. *elegantissima*, M 29.

var. *filiformis*, L 11 a.

var. *intermedia*, L 27 c, 33 c, 35 b, 12, 15 b, 18.

var. *pendula* (Syn. *T. filiformis*, Lodd.), L 11 a.

var. *semperaurascens*, M 19. (Sydney Botanic Gardens.)

5. Libocedrus.

A genus of evergreen trees of Thuia-like aspect, mostly with spreading branches and flattened branchlet systems. The narrow pear-shaped fruit of the genus is a character.

(1.) *L. chilensis*, Endl. "Chilian Arbor-Vitæ."

A medium-sized tree of pyramidal outline.

"It is common in some of the valleys and along the lower slopes of the Chilian Andes, from Valparaiso southwards to Valdivia. The wood is soft and easy to work, and is highly valued by the inhabitants for indoor carpentry on account of its fragrance."—(Veitch's Manual.)

It is stated rarely to escape injury in Britain in severe winters, and is one of the species which should be thoroughly tested in the colder parts of New South Wales. In the Sydney district it objects to the spells of hot, dry weather.

(2.) *L. decurrens*, Torrey. "Californian White or Incense Cedar."

A lofty stately columnar tree of 100–150 feet, under favourable conditions. Native of California, attaining its greatest development between 3,000 and 7,500 feet.

Through an unfortunate confusion of botanical material, this species has been much mixed up with *Thuia gigantea.*

This beautiful species should be well tested in New South Wales.

(3.) *L. Doniana*, Endl. The "Kawaka."

A forest tree of about 50 feet and more, found in the North Island of New Zealand from Mongonui southwards to Hawke's Bay and Taranaki, from the sea-level to 1,000 feet.

It is not abundant, but its timber is much appreciated for ordinary building purposes.

Garden Palace Grounds.

(4.) *L. Bidwillii,* Hook. f. "Pahautea" or "New Zealand Cedar."

Very similar to the preceding species, but usually smaller; a shrub in sub-alpine localities.

Found in the North and South Islands of New Zealand, from Te Aroha Mountain and Mount Egmont southwards to Foveaux Strait.

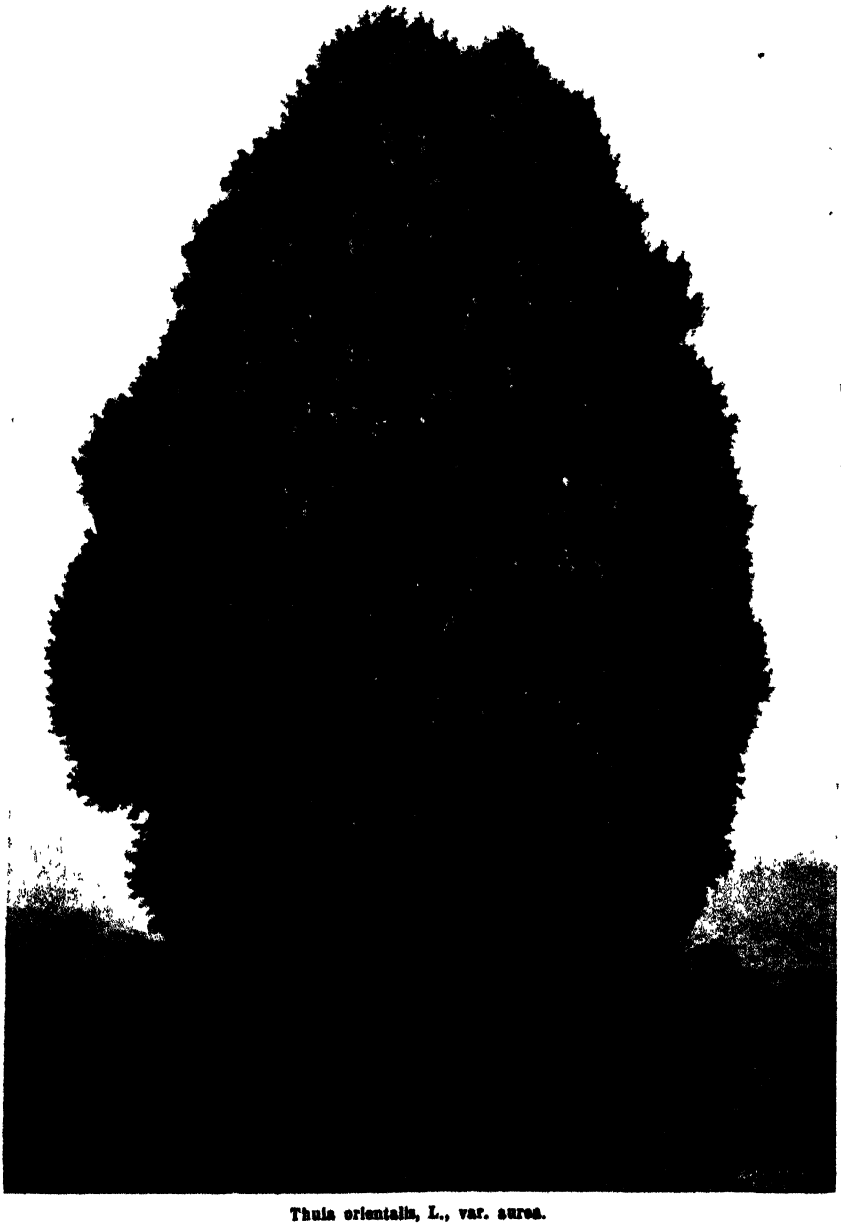
"Often confounded with *L. Doniana*, but the obviously tetragonous branchlets of the mature tree, with almost uniform leaves, are characteristic and readily distinguish it."—(Cheeseman.)

Not in the Sydney Botanic Gardens.

(5.) *L. tetragona*, Endl.

An interesting Conifer from the western slopes of the Andes of southern Chili. It inhabits the same region as *Fitzroya patagonica* and the foliage of the two trees is much alike, so that the two trees have become confused by travellers who have not closely examined them.

"The climate of the region it inhabits is one of the most equable, and also one of the most humid in the world; for upwards of six months of the year rain falls daily, and on rainless days the sky is sometimes overcast for weeks together; the average summer temperature is about the same as that of Great Britain, but the mean winter temperature is higher."—(Veitch's Manual.)



Thuja orientalis, L., var. aurea.
State Nursery, Campbelltown.

Cryptomeria japonica, D. Don.
Federal Government House, Sydney.

Tribe—TAXODINEÆ.

6. Athrotaxis, Don.

A genus of three species endemi- in Tasmania and confined to the Western Mountains.

A. laxifolia is the most restricted, being only recorded from the Field Range, near La Perouse.

Leaves 1-2 lines long.	
Leaves closely pressed to the stem, very obtuse ...	... *A. cupressoides.*
Leaves looser, acute	... *A. laxifolia.*
Leaves 3-4 lines long	... *A. selaginoides.*

These Pines are handsome trees, and are worthy of cultivation in the coldest parts of New South Wales.

The genus is of special interest from a palæobotanical point of view.

(1.) *A. cupressoides*, Don. The true "King William Pine."

A tree which is often irreverently called in Tasmania simply "King Billy."

A small erect tree of 40 feet.

(2.) *A. laxifolia*, Hook. f.

Very much like the preceding in habit.

(3.) *A. selaginoides*, Don.

"Red Pine," because of the colour of the wood. The name is often applied to the other species. The tree is sometimes also called "King William Pine."

A small erect tree, extensively but symmetrically branched, 40–50 feet high. (Rodway.)

7. Cryptomeria.

A monotypic Japanese genus of considerable palæobotanical interest.

(1.) *C. japonica*, D. Don. The "Sugi" or "Japanese Cedar."

A stately tree, attaining a height of over 100 feet in its native country. The avenue of Nikko is one of the most celebrated in the world.

It has been very extensively cultivated in Japan and many parts of the world, and a number of horticultural varieties are recognised. It does well in many parts of New South Wales. Its timber is very extensively used for box-making and miscellaneous purposes in Japan. No wood is more largely used in that country.

L 6 a (var. *Lobbii*), M 19 (Sydney Botanic Gardens).

8. Sequoia, Endl.

This genus, comprising two noble American trees, also includes a few well-marked fossil species.

(1.) *S. sempervirens*, Endl. The "Californian Redwood."

Figured by Sargent, t. 535.

Confined to the Pacific littoral from the southern boundary of Oregon to a little below Monterey in southern California.

A gigantic tree, attaining a height of 180–250 feet, with a diameter near the base of 12 to 18 or more feet.

Professor Sargent, in his "Silva of North America," says:—"The Redwood (*Sequoia sempervirens*), which is the tallest American tree, probably occasionally attains the height of 400 feet and more. The tallest specimen I have measured was 340 feet high. Among American trees the redwood is exceeded in size only by *Sequoia Wellingtonia.*"

It grows in rather dry situations, but it attains its best development in areas enveloped with ocean fogs.

This is the tree that yields the Californian Redwood so largely imported into this State. It is a soft, light, easily worked, durable, not readily inflammable timber, not liable to warp.

M 19, L 1, 2, 7 a, 11 (Sydney Botanic Gardens).

(2.) *S. Wellingtonia*, Seem. The "Big tree" of the United States.

Figured by Hooker, *Bot. Mag.* tt. 4777, 4778; Sargent. t. 536.

The largest tree in the world.

Professor Sargent says:—"Its average height is about 275 feet and its trunk diameter near the ground 20 feet, although individuals from 300 feet to 320 feet tall, with trunks from 25 feet to 35 feet thick, are not rare." Speaking of the celebrated Calaveras trees, he says:—"In the Calaveras grove there are three trees over 300 feet high, the tallest measuring 325 feet. The largest tree measured is standing in King's River forest, and 4 feet above the ground has a diameter of 35 ft. 8 in. inside the bark."

"In Great Britain the Wellingtonia is characterised by extreme formality of habit, which is that of a spire or elongated cone, its outline scarcely broken by a projecting branch."—(Veitch's Manual).

In U 6, southern side (Sydney Botanic Gardens) is a small specimen of this interesting tree. The Sydney climate is, however, too warm for this species.

9. Taxodium, L. C. Richard.

This genus of two species is commonly called "the Deciduous Cypress."

It is represented in bygone geological ages.

(1.) *T. distichum*, L. C. Richard. "Deciduous Cypress." "Bald or Swamp Cypress" of the Americans.

Figured by Sargent, t. 537.

A large deciduous tree, attaining its greatest development in Mexico, but abundant between the 39th parallel of north latitude and the Gulf of Mexico, and extending from the Atlantic Ocean westward to the 98th meridian.

Sequoia sempervirens, Endl.
State Nursery, Campbelltown.

Taxodium mucronatum, Ten.
Botanic Gardens, Sydney.

There is a smaller form, var. *pendulum*, figured in *Bot. Mag.* t. 5603.

This noble tree does well in the Sydney district and in our coastal lands generally (*e.g.*, it does well with Mr. P. H. Morton, near Berry), in moist bottoms, preferably liable to inundation.

From the large spreading roots, which are often near the surface, numerous "knees" spring out, which give the trees a singular appearance, and have,

doubtless, allied functions to those of the pneumatophores of the mangroves. For an illustration of a Syon House tree (near London) showing the "knees," see Veitch's Manual.

M. 19 (Sydney Botanic Gardens).

(2.) *T. mucronatum,* Ten. (*T. mexicanum,* Carr.), is a variety of *T. distichum.* It does very well in Sydney.

U 7, L 1, 18 (Sydney Botanic Gardens).

10. Sciadopitys, Sieb. and Zucc.

A montypic genus confined to one district of Japan.

"Like the Ginkgo, it stands alone amidst the existing vegetation, so that if the hypothesis of its great antiquity has any real foundation, a whole series of forms which once connected it with other types must have been swept away, leaving the Sciadopitys as the sole survivor of a phase of vegetation long since extinct."—(Veitch's Manual.)

(1.) *S. verticillata,* Sieb. and Zucc. "Umbrella Pine."

See Sieb. and Zucc., Flora Japonica, ii, tt. 101, 102; also Veitch's Manual.

Has been cultivated from time immemorial by the Japanese around their temples. In its greatest development it attains a height of 100 feet.

It is a beautiful and singular-looking tree. It is remarkable for the verticillate rays of "cladodes," or foliage of peculiar structure. The leaves are scale-like, of deltoid shape, and soon falling off; from the axils of these arise the phylloid shoots or cladodes, which perform the functions of true leaves.

Every connoisseur, suitably circumstanced, should endeavour to grow this remarkable tree. It grows in the Sydney Botanic Gardens (M 25), but does not flourish. It does not appear to be thoroughly happy in Britain. Veitch's Manual states that "where the Rhododendron thrives the Sciadopitys will grow. This means that the soil in which the Sciadopitys is planted must be sufficiently retentive to afford a constant supply of moisture to the roots during the growing season; where this supply is intermittent, that is to say, when the Sciadopitys is planted in a soil that is sometimes dry and sometimes wet, according to the changes of weather, it does not thrive."

(To be continued.)

Aberdeen-Angus Cattle.

JOHN MOIR.

There is still a diversity of opinion regarding the origin of the Aberdeen-Angus cattle. By some, it has been seriously argued that they are an original and distinct species, while others maintain that they are a distinct departure from the original cattle of ancient Caledonia. Certain it is that they have had a separate existence for a long period of time, and if the latter theory of variation is correct, how and when these departures may have been effected must be left in a large measure to conjecture.

The idea which finds most favour is the probability that the peculiarity, such as being hornless, may have appeared suddenly, owing to spontaneous variation, and that these results have come to possess a powerful hereditary tendency. These spontaneous variations or organic changes must have occurred since domestication took place, for while deviations from the original form of animals may arise spontaneously, some sort of selection in breeding is necessary in order to impart to those isolated deviations such fixity of character, or such strong hereditary power as would ensure their perpetuation. Among cattle completely wild, no artificial selection could take place, but with those under domestication the case is different, as isolating and breeding from no other but animals possessing a peculiarity would, in time, lead to perpetuation or hereditary fixity.

Polled varieties of cattle have been more widely spread than is generally supposed, but there is nothing to lead to the supposition that there is any near affinity between one another. Herodotus, writing of the Scythians, mentions that their chariots were drawn by oxen without horns, the cold preventing their having any; and Darwin states that a polled variety of cattle existed in Paraguay, South America, at the close of the eighteenth century. In Sutherlandshire, Scotland, there was a polled variety in 1769, and, according to Boswell, another in the Isle of Skye about 1773, while similar characteristics appeared among the cattle of Iceland at a less remote period. And, although the Scotch Galloway cattle of to-day may have a certain resemblance to the Aberdeen-Angus, there is certainly no nearer kinship between them than that the ancestors of each breed have sprung from one parent stock in the ancient cattle of Caledonia. Previous to the close of the eighteenth century, nearly all the Galloways were horned, and, indeed, there is a very close resemblance between them and the present Highlander—minus the horns. But the same theory applies to all, and the case of the Galloways is the strongest

proof of it. There has been a sudden appearance, through spontaneous variation, organic or accidental change (if there is an accidental change in Nature) of one or more animals without horns, and the preservation of the new feature has been perpetuated, since the cattle were domesticated by some kind of selection in remote ages, sufficient to stamp with permanency the exceptional characteristic of being polled or dodded.

There can be little doubt that the breed is indigenous to the very districts which still form its headquarters, namely, Aberdeenshire and Forfarshire, although it is not now generally disputed that the latter tribe was but a branch of the former, altered to a considerable extent by different surroundings. But from earliest history, the cattle of Buchan, in Aberdeenshire, are referred to as a distinct breed, and this

Aberdeen-Angus Bull, Everall (imp.), aged 20 months.
Property of Messrs. White Bros., Edinglassie, Muswellbrook.

is what removes the question of date of origin furthest from mere assumption. The lower part of Aberdeenshire was known by the name of Buchan, at least two centuries before the days of Wallace and of Bruce. The derivation of the word is the Gaelic "Bo," meaning an ox, and "caen," the head; so that in the eleventh century, if not much earlier, there was something about the heads of the cattle of this part of the country distinctly different from those of other localities. Their history beyond this period is lost in the mist of antiquity, and the nearest that mortal man can approach to accuracy is that the breed has existed in Aberdeenshire from time immemorial.

The earliest records of their utility are furnished by the Williamsons of St. John's Wells, Fyvie, who, about the year 1770, were the principal cattle dealers in Scotland. They stated that they preferred them to others, "as they were most easily maintained, more hardy in work, have flesh of the finest grain, and pay better in proportion to the goodness of their keep." So even, at this date, the breed had such well-defined features as to mark it out for such excellent properties that the most extensive cattle dealer in Scotland regarded them as superior to all other varieties.

The breed first came into prominence in British history at the Highland and Agricultural Society's Show, in 1829, when Mr. Hugh Watson triumphed for the best fat stock of any breed. One of his exhibits was afterwards shown at Smithfield, where she won the medal in the class for extra stock. Her breast was not quite 8 inches from the ground. Mr. McCombie, of Tillyfour, was the next to enter the field with them, and in 1847 he gained the championship at the National Show. From that date until his death he maintained a foremost place. At the Paris Exhibition of 1856, he was awarded the gold medal for Charlotte, the dam of Pride of Aberdeen. In 1862, at Paris, he secured similar honors for the best ox. But the greatest triumph of the breed was at the International Competition at Paris, in 1878, where the Tillyfour group, by twenty-four votes out of thirty-one, won the grand championship of the show.

THE SMITHFIELD SHOW IN LONDON.

THE Smithfield Show, in London, is the great fat stock court of appeal, and here the Aberdeen-Angus claim a wonderful record. As early as 1867, Mr. McCombie first placed the breed indisputably before all others at the great London Show. But it was only in 1891 that Aberdeen-Angus cattle had separate classes provided for them. Reckoning from this date, it is found that no fewer than in seven of the last fifteen shows of the Smithfield Club, have the premier honors of the show been awarded to the Aberdeen-Angus, not to speak of the numerous subsidiary honors, such as reserve championships, which have been gained, in addition to the crossbred honors in which the breed participates. In 1893, there was Pride of the Highlands; in 1894, Benton Bride; in 1896, Minx of Glamis; in 1898, Ju Ju of Glamis; in 1901, Burnhilde of Glamis; and in 1902, Layia of Glamis. These, with their predecessors, Luxury, in 1885, who gave the world's record block test of 76·75 per cent., and Young Bellona, in 1887, form by no means an insignificant array, and amply bear out the claims made on behalf of the breed as the premier beef-producing cattle of the world.

An interesting comparison is provided by the results of the last Smithfield championship in the last few years, and as the animals were 2-year old heifers, and accordingly on a common basis as regards age, the following table shows how Aberdeen-Angus cattle yield at the block:—

Breed.	Live weight. lb.	Dead weight. lb.	Block test. per cent.
A.A. Burnhilde	1,806	1,288	71·32
A.A. Layia	1,805	1,258	69·14
A.A. Shorthorn cross	2,119	1,462	68·99
Shorthorn	1,754	1,194	68·07
A.A. Burn-Bellona	1,807	1,286	71·11

The most extensive herd of Aberdeen-Angus in Australia is owned by Messrs. White Bros., of Edinglassie, Muswellbrook, the number of pure and grade cattle on their various properties being over seventy thousand. Their cattle, with the greater part of their development on the roasts and rump, are ready for the butcher at three years of age, and they find in the breed the valuable qualities so forcibly asserted and amply demonstrated by the great departed McCombie—hardiness of constitution, a frugal nature, early maturity, a minimum of waste, and a maximum of meat.

Hawkesbury Agricultural College and Experimental Farm.

Construction of Pig-sty Buildings.

[Continued from page 667.]

A. BROOKS,
Foreman of Works, Hawkesbury Agricultural College.

STIES for sows are not required to be so strongly built as those previously described for boars, but should be differently arranged. The walls no more than 3 ft. 6 in. high, may be of lighter material. For sows with litters, they should be larger, and where it is desired to make the one building provide for these, and also sows not farrowed, it is a good plan to have the alternate partition walls movable, so that two sties can be opened out into one larger one, or if they are kept 9 inches clear of the floor to allow the youngsters to get under to a separate feed trough, the

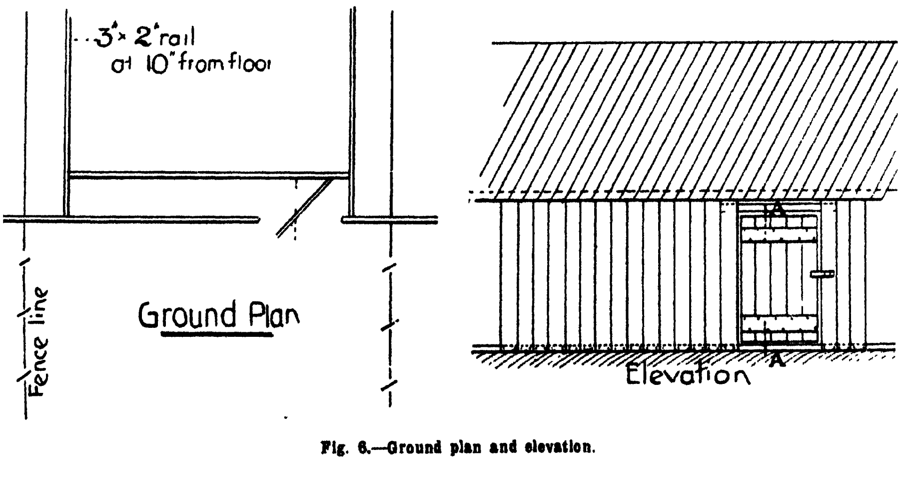


Fig. 6.—Ground plan and elevation.

sow can be kept in one compartment, while the suckers have the run of two. A guard-rail of 3 in. x 2 in. hardwood, which may be arranged to be portable, should be placed around the back and two sides at about 15 inches from the walls and 10 inches clear of the floor, to protect the suckers from being crushed against the walls. The door on the back wall opening out into the run should be pivoted top and bottom at 9 inches from one edge of the door (see A A on elevation Fig. 6), so that it may be set in position to allow the suckers only to pass out if required (see ground plan, Fig. 6). The button on the outside of the wall turned horizontally, as shown on elevation, secures the door, so that the sow cannot get through.

Figs. 7, 8, 9, and 10 show part of ground plan and elevations of a building for sows and two boars, together with store-rooms at one end. The sties are large enough for sows, with or without litters, and if the

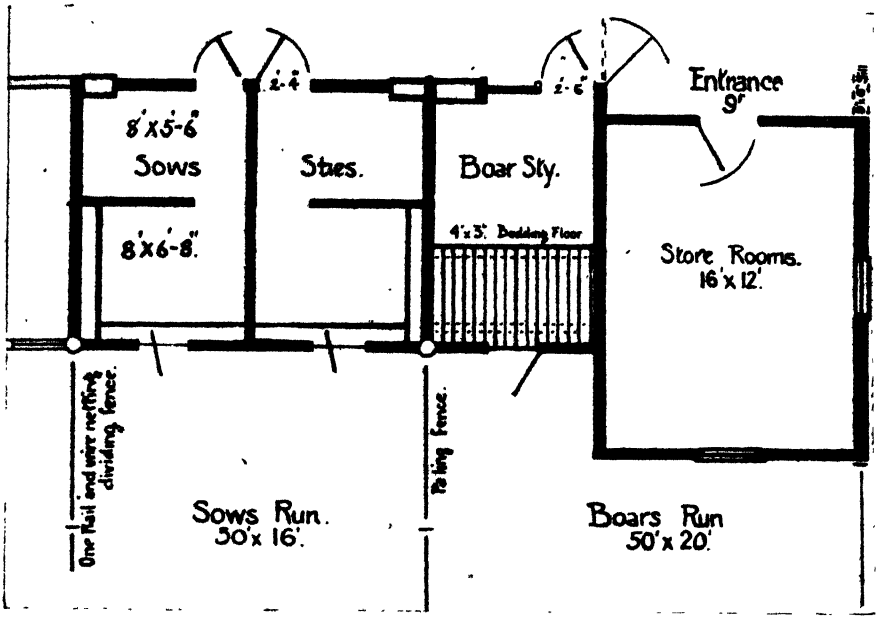


Fig. 7. Part of ground plan of Pig-sty building.

slight extra cost of construction be no obstacle, this plan is perhaps better than that with smaller sties and movable partitions; but the guard-rails may be movable, as they are in the way when cleaning out. The yards

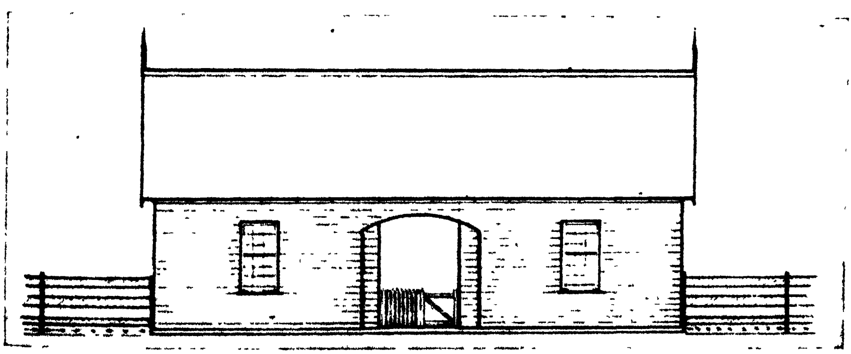


Fig. 8.—Front end elevation.

or runs may each be double size, that is, for sties 8 feet wide, yards would be 16 feet or two panels wide, so that when the sow of one sty is let into the yard the other is closed in, giving more room for exercise, and less fencing to erect.

The site of the building may have considerable fall lengthways, as much as 1 in 48, equal to about 4 inches across each two sties. With this grade the floors of the sties can be laid level across, and stepped down 4 inches at alternate sties (see A, Fig. 11), while in the passage the floor

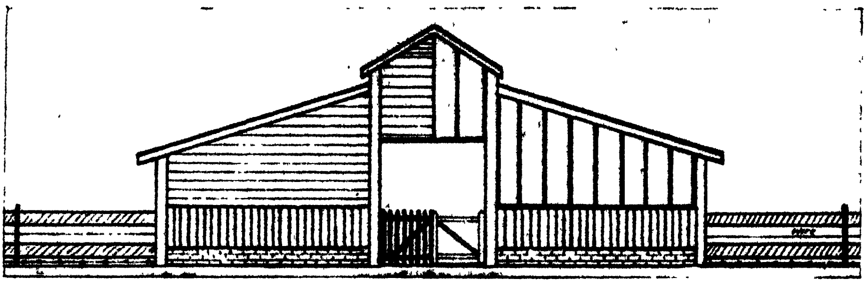


Fig. 9.—Back end elevation.

and gutters may have one continuous slope thus giving excellent drainage, as shown on line of gutter. At each drop or step in the floors the bricks should be laid ends up, as also along the front edge at the doors and troughs forming the side of the gutter, and the passage floor should be rounded up in the centre 2 inches.

Walls.

The construction of walls with hardwood boards in 4 in. x 3 in. hardwood framing, set on dwarf walls, with three courses of bricks over the floors, is shown at Fig. 12, which is a half section of the building, as

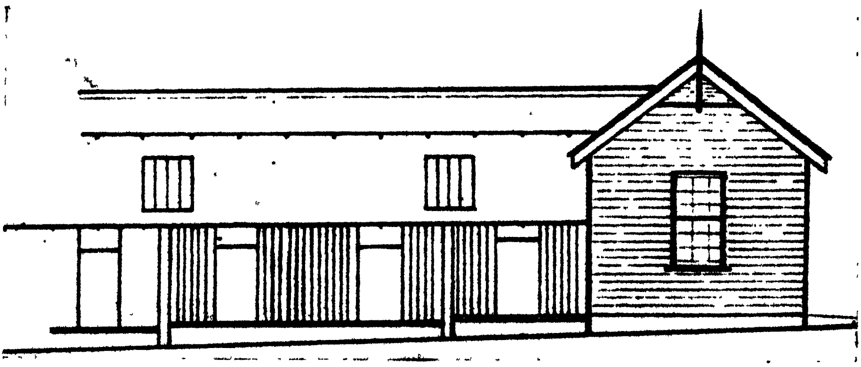


Fig. 10.—Side elevation of sties.

shown in plan, Fig. 6, showing roof, walls, floors, and feeding troughs with swinging flaps. Constructed in this way these walls cost about 50s. per square 100 feet, that is, 10 ft. x 10 ft., or 30 lineal feet of walls 3 ft. 4 in. high, which would do, say, two sides and back wall of one sty.

A better and cheaper Wall.

Fig. 13 shows a section of a dividing wall constructed of 24-gauge galvanised corrugated iron, set into the brickwork of the floor, and secured at the top between two pieces of 3 in. x 2 in. hardwood as a top rail, single lapped and bolted at the edges with ¾-in. roofing bolts.

The surface of the floor has a 2-in. fall towards B, but in order to allow the ends of the sheets of iron being square, the row of bricks A to A, on which the iron stands are laid quite level on the top (and edgeways), and being ½ inch below the floor at B, are 2½ inches below at the back. This makes a groove in the floor 3 inches wide, and when setting up the iron walls the sheets are placed close against the side of

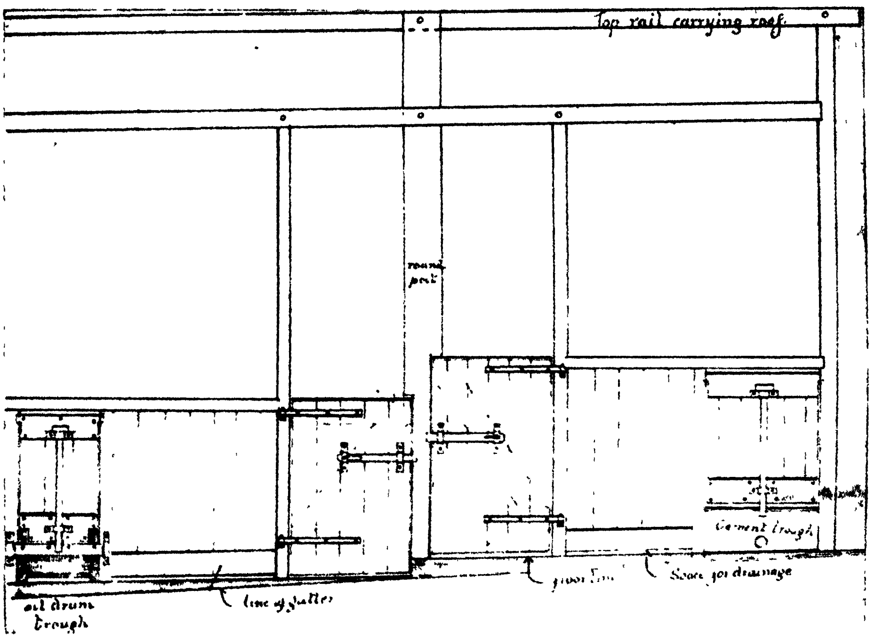


Fig. 11.—Front wall with troughs and doors.

this groove, which enables them to be kept straight on the face at the bottom. There is then a space of about 2 inches wide, as at C, and this is filled in with fine cement concrete flush with the floor only, until all is secured, when the angles are filled in, as shown at D, with similar concrete, and smoothed off on both sides of the wall. This makes not only a strong job of the wall, but the work of cleansing easy, and the sty more sanitary. Then to make a finish to the top, a coping piece 4¾ in. x 1 in. hardwood may be nailed over the two pieces of 3 in. x 2 in. rail pieces, as shown at E. This is a better wall construction than timber, having no ledges or angles, is perfect from a sanitary point of view, and much cheaper.

The front walls, with the doors and troughs fitted in, as shown on Fig. 11, may be constructed with iron also, using the ledges on the

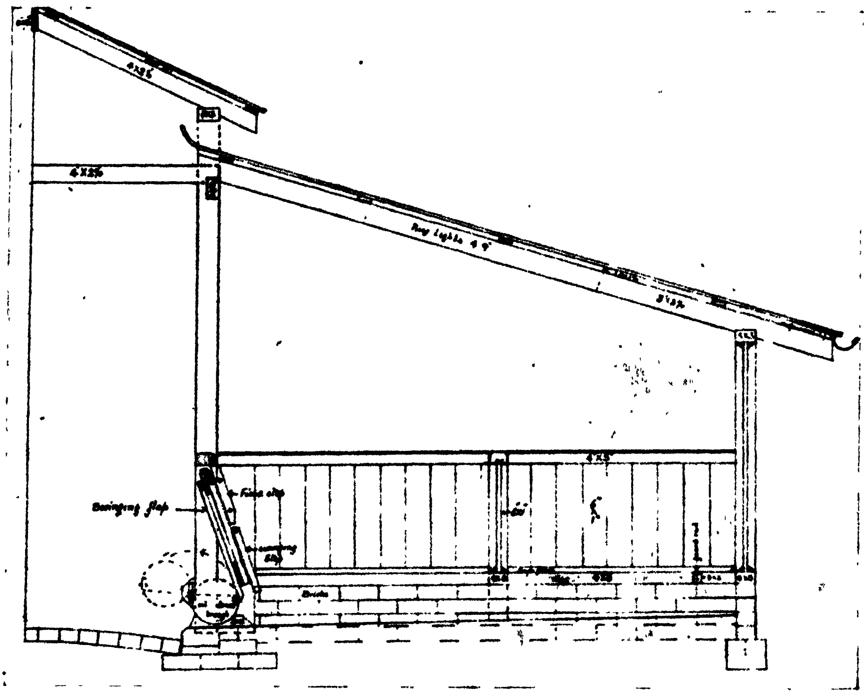


Fig. 12.—Half section of building for Sows' sties.

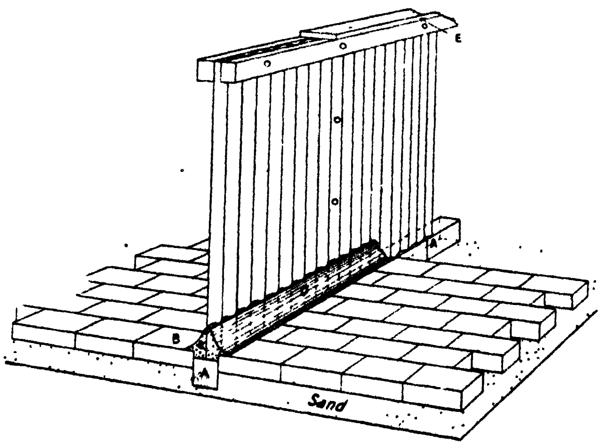


Fig. 13.—Corrugated galvanised-iron wall.

bottom, on outside only. This would be necessary, as they must be clear of the floor to allow the drainage from the floor to pass under, and on

dividing walls where provision is required to be made for suckers getting through, holes may be cut out.

Floors.

Undoubtedly, brick paving laid flat makes the best flooring for this class of building, and for the bedding floor if it is desired to have them movable, a light floor, as shown at Fig. 14, made of 3 in. x 1 in. pine

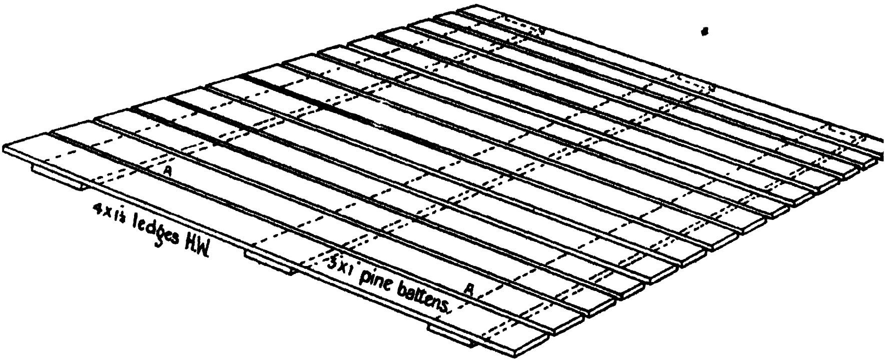


Fig. 14.—Movable bedding floor.

battens, nailed to three ledges of 4 in. x 1¼ in. hardwood, with ½ in. spaces between the battens, will be found very suitable. These make very serviceable floors, where it is not thought too much trouble to move and clean; but if a permanent floor is required, then it should be constructed as shown on Fig. 15.

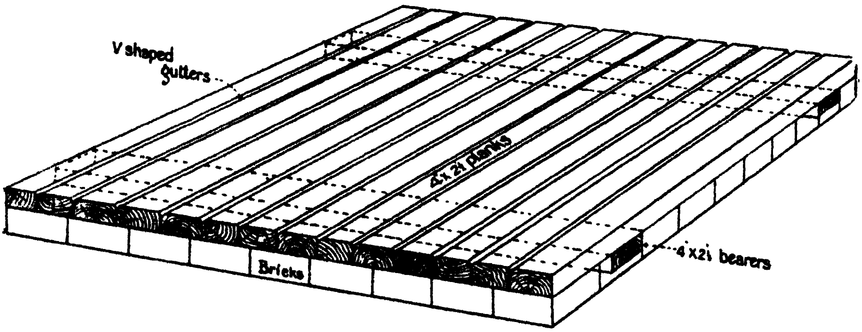


Fig. 15.—Solid bedding floor.

For either floor it is advisable to lay the brick paving underneath. For the solid floor (Fig. 15) two bearers of 4 in. x 2½ in. hardwood should be securely bedded, either on flat or on edge, to spike the floor planks to, at about 6 inches from the ends front and back. It will be seen that each of these floor planks of 4 in. x 2½ in. hardwood have the top corners

planed off, forming V-shaped gutters for drainage, and to make the floor watertight, the planks must be thoroughly coated with hot tar and spiked close together. These floors are the best job when done, but they cost about three times as much as the batten floor. To prevent the bedding from being scattered off the bedding floor, a front board of 6 in. x 1 in. hardwood, with cross ledges about 6 in. from each end, and provided with

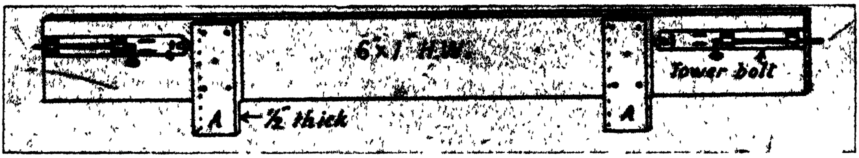


Fig. 16.—Front board for bedding floors.

two 6 in. tower bolts (as Fig. 16), the bottom ends of the ledges reduced in thickness to ½ inch to fit into the spaces between the battens as at A (Fig. 14), or mortises that may be made in the solid floor, and holes in the side walls to receive the ends of the tower bolts should be provided.

(*To be continued.*)

Monthly Weather Report.

HAWKESBURY AGRICULTURAL COLLEGE, RICHMOND.

Summary for September, 1907.

Air Pressure (Barometer).			Shade Temperature.				Air Moisture Saturation = 100.			Evaporation (from Water Surface).			
Lowest.	Highest.	Mean.	Lowest.	Highest.	Mean.	Mean for 15 years.	Lowest.	Highest.	Mean.	Most in a Day.	Total for Month.	Monthly Mean for 9 years.	% of the year's Evaporation
29·71 9	30·37 14	30·08	26·2 4	93·0 20	59·13	57·45	36 24	93· 9·15	55·23	·430 22	4·886	3·443	10

Rainfall...				
Points ...	1½	12½	2½	= 16½ points. Mean rainfall for 15 years = 178 points.
Dates ...	9	10	25	

Wind ...	N	NE	SE	S	SW	W	NW
	2	10	1	8	9	9	2

Greatest daily range of temperature = 52·9° on 20th.

	93·0	91·5	91·0	90·5	92·7
Temperature rose above 90 on	20	21	22	23	24

	33·5	26·2	29·6	34·0	31·1	35·2	31·2	34·1
Frosts recorded on	2	4	5	8	12	14	15	16

A very dry, dusty month, with strong N.W.-S.W. winds.

Temperature well above the average. Bush fires common on the hillsides.

W. MERVYN CARNE,
Observer.

Sorghum.

Variety Trials and Fertiliser Experiments.

A. H. E. McDONALD,
Experimentalist.
Fertiliser Notes by
CUTHBERT POTTS,
Lecturer in Chemistry, Hawkesbury Agricultural College.

TRIALS were conducted with sorghum during the past season with the object of:—

1. Comparing different varieties.
2. Obtaining information as to the fertiliser or combination of fertilisers which is most suited to the requirements of this crop when grown as a green feed. These experiments are similar to those conducted during the 1905-6 season (see *Agricultural Gazette*, November, 1906).

Early Amber Cane.

Soil.

In both cases the soil was a stiff pipe-clay loam, rather poor, and liable to set together after rain owing to the large amount of clay in its composition. It was difficult to get into condition, but after ploughing twice, and harrowing and rolling thoroughly, it was reduced to a fine tilth and formed a good seed-bed.

Variety Trials.

A noticeable difference occurred in the time occupied by the different varieties in appearing above the ground. Early Amber Cane and Kaffir Corn came up in about nine days, but it was some time before the Planters' Friend showed. Shortly after the plants commenced to grow, dry weather set in, and prevailed until the end of January (Chart No. 2). The weather conditions during the early part of the season were unfavourable, and it was only by continuous cultivation that the crop was enabled to maintain a healthy condition. The fall of fair rain in January saved the crop, and a fairly large yield was harvested.

In Table 1 the results of the experiment are recorded.

TABLE 1.—Results of Variety Trials.

Variety.	Previous Crop.	Date Sown.	Date Harvested.	Area of Plot.	Yield per Plot.	Yield per Acre.
		1906.	1907.	acre.	tons cwt qrs. lb.	tons cwt. qrs. lb.
Early Amber Cane..	Oats ..	19 Nov....	27 Mar. ...	·18	1 13 0 26	9 4 2 16
Planters' Friend ..	Oats ..	19 Nov...	3 May...	·20	1 19 2 20	9 18 1 16
Kaffir Corn ..	Oats	19 Nov...	3 May..	·11	0 14 2 21	6 13 2 8

Early Amber Cane germinated quickly and made rapid growth. It grew to a greater height than Planters' Friend, but was thinner in the stem and not so leafy. It matured five weeks earlier than the other two varieties, which ripened together. It is consequently better suited for providing an early supply of greenstuff.

Planters' Friend made vigorous growth and produced the heaviest yield of greenstuff per acre. The stems were rather thick, but succulent, and carried many green leaves. It was somewhat late in maturing. Its only drawback is the difficulty in getting a good stand, owing to the slow germination of the seed.

Kaffir Corn made slow growth, and was stunted by the dry weather. It does not seem to possess good drought-resisting qualities, and the forage it produced was rather light and dry in character.

Although sorghum is well known in the coastal districts, and occupies an important position among the crops grown as feed for dairy cows, its value is not recognised as largely in many of the drier inland districts as it deserves. With the spread of dairying in recent years to these districts, it has become necessary to provide green stuff to supplement the natural grasses, and to guard against periods of shortage. No summer crop can be more confidently recommended for these purposes than sorghum. In their very early stages the plants are a little weak, but after the first few days they rapidly develop great hardiness, and will

stand more dry weather with less injury than most crops. After it becomes firmly established it will stand several months of dry weather, and although it may seem quite at a standstill, responds readily when rain falls. It is this characteristic which renders it peculiarly suitable for inland districts where very often rain falls in the early summer, and afterwards a long period of dry weather is experienced until about January or February. During this time the sorghum will make little growth, but maintains a healthy condition, and when rain falls, rapidly makes headway. In favourable seasons it does not give as large a yield as maize, but its power of resisting drought is greater; and in districts where dry conditions are the rule, it will be found, if an average of the results obtained during a number of years is taken, that it yields very satisfactory returns.

TABLE 2.—Results of Fertiliser Experiments.

No. of Plot.	Manures used.	Amount per Acre.	Cost per Acre.	Yield per Acre.	Increase due to Manure.
		lb.	s. d.	tons cwt. qrs. lb.	tons cwt. qrs. lb.
1	*Unmanured	......	......	8 8 3 20	....
2	Superphosphate... . ..	128	4 10	10 4 1 4	1 17 1 8
3	Muriate of potash	64	7 8	11 15 2 24	3 8 3 0
4	Sulphate of ammonia	32	3 10	12 11 1 20	4 4 1 24
5	Superphosphate ... . Muriate of potash . ..	128 64	12 6	10 1 0 18	1 14 0 22
6	Superphosphate... ... . Sulphate of ammonia ...	128 32	8 8	10 1 0 18	1 14 0 22
7	Muriate of potash ... .. Sulphate of ammonia	64 32	11 6	13 3 0 24	4 16 1 0
8	Superphosphate... ... .. Muriate of potash ... ... Sulphate of ammonia	128 64 32	16 4	10 6 1 20	1 19 1 24
9	Superphosphate .. .. Sulphate of potash ... ... Sulphate of ammonia	128 64 32	16 4	12 7 2 0	4 0 2 4
10	*Unmanured	....	......	8 5 0 0	....

* Average of unmanured plots = 8 tons 6 cwt. 3 qrs. 24 lb.

Fertiliser Experiments.

The objects of these experiments are:—

1. To determine the effect of supplying the crop with only one of the three plant foods: phosphoric acid, potash, and nitrogen.
2. To ascertain the effect of mixtures of these in pairs and in complete manures.
3. To compare the effect of muriate of potash with sulphate of potash in a complete fertiliser.

In Table No. 2 are recorded the details of the experiment, showing how each plot was treated and the corresponding yield. Similar experiments were conducted last year,* and it is proposed to continue these experiments for several years to come.

The results of the two years are shown graphically in Chart No. 1, while the rainfall and evaporation curves are given in Chart No. 2.

On examination of these charts it will be noted that during the present year the rainfall was unfavourable during the early part of the season, while the evaporation was high; during the latter part of the season, however, the rainfall was fair in each year, consequently, it is to be expected that the yields during this year should be less than those of 1905-6.

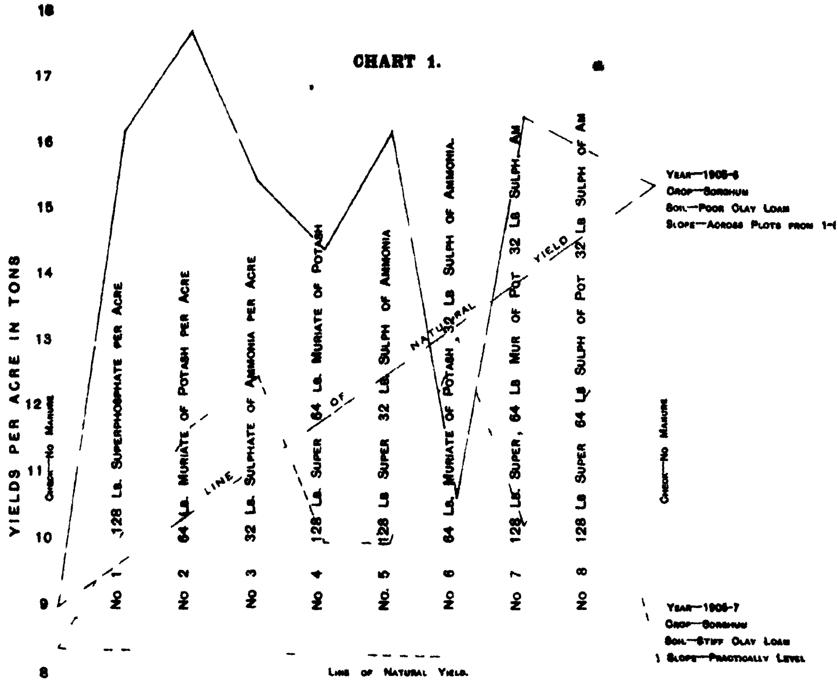
Consideration of Chart No. 1.

It is evident from the natural yield line of 1905-6 that the arrangement of the plots does not give sufficient check, and we hope to improve this in the subsequent trials, by flanking each check with a waste plot and introducing a check in the centre. Undoubtedly, the checks of 1905-6 were in part impaired by the slope of the land which, running down from Plot 1 to Plot 8, may, on account of seepage water carrying fertilisers, have caused the high yield in Plot 8.

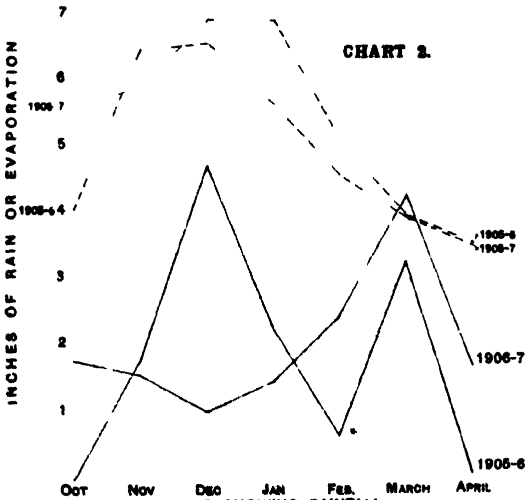
Provisional Conclusions as regards the action of the Fertilisers.

1. Superphosphate alone gives increased yields, but its action is probably relatively greater when there is abundant rain during the early part of the season.
2. Potash has a greater effect on the crop than superphosphate, though, probably, not so much greater if the superphosphate is well diffused by early rains, and is thus enabled to play its secondary part in liberating potash from the soil.
3. The results with the sulphate of ammonia are somewhat contradictory; but we anticipate that the result of the 1906-7 season is the more normal. The heavy nature of the soil may have had a retarding effect in the wetter season of 1905-6.
4. It is interesting to note that, in each year when muriate of potash was mixed with superphosphate alone, or with sulphate of ammonia and superphosphate, the yield falls below that of super-

* *Agricultural Gazette*, November, 1906, page 1093.



CURVES SHOWING YIELD PER ACRE WITH DIFFERENT MANURES



CURVE SHOWING RAINFALL ——
AND
EVAPORATION FROM WATER SURFACE - -

phosphate alone. This, we anticipate, will always be the case, as it seems probable that superphosphate and muriate of potash would have an interaction, yielding as a product muriate of lime, which is injurious to plant growth. If such is the case we should expect that when sulphate of potash replaces muriate of potash in a mixture with superphosphate, increased yields would be obtained. Such is the case in 1906-7, but not so in 1905-6. We believe, however, that the 1906-7 result will be confirmed in future experiments, believing that the 1905-6 result was in some part due to seepage. In order to bring this point to light, we hope to introduce more plots manured with sulphate of potash alone and in mixture

5. The results for the two years of the mixture containing sulphate of ammonia and muriate of potash are distinctly contradictory, and until further evidence is brought forward we can draw no conclusions.

General Notes.

We would bring before the notice of each farmer the necessity of making his own manure trials.

While the work we are conducting is of great value in determining the general principles underlying profitable manuring for our conditions of soil and climate, it must be remembered that there are many minor differences in every district, and even on each farm, which influence the results.

What may be the best practice in one district may be only second best in another.

If simple fertilisers are purchased and each man makes his own mixtures, it is a matter of extreme simplicity to try three or four drills of this or that mixture, until by trial a farmer determines what is the best practice for his particular district. One word of caution: keep a tight hand on the manure bag, and let good soil culture have fair play. Fertilisers only have their best action on a well-tilled soil.

Each man should endeavour to obtain the fullest information on the influence of climate on the crop, the deficiencies of the soil, and the needs of the crop grown. It is hoped that by taking the results of experiments such as these as a foundation for further work, this information can be acquired.

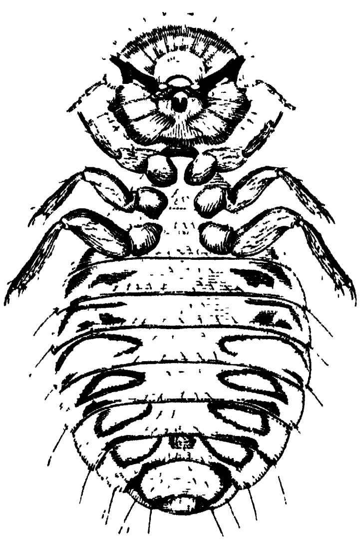
Diseases of Fowls.

[Continued from page 806.]

External Parasites: Fleas, Lice, Ticks, Mites, etc.

G. BRADSHAW.

Every living thing has its own particular vermin, both internal and external, and possibly poultry, of all creatures, have the greatest number and variety. It is claimed by some writers that a few vermin on ordinary healthy fowls in no way affects their health, it being when such multiply exceedingly that they do the harm; and when such time arrives it most frequently happens the host, if a chicken, has become so emaciated from their effects that the application of remedial measures but hasten death, again showing that parasitic troubles are just like diseases—prevention, in every instance, is better than cure, *i.e.*, clean fowls can be easily kept clean, while the internal and external parasites, when but few, can be easily exterminated.



Chicken Louse (*Goniocotes abdominalis*).

Some scientists tell us that external vermin on domesticated fowls reach upwards of a score of varieties; others about half that number. Some make two groups of them, lice and mites; the definition of others is lice, mites, ticks, and fleas, and for the purposes of this article such definition is sufficient.

All lice are what is known as pennivorous, that is, living on the feathers and outer scales of the skin, but not puncturing the integument in search of their natural food; the damage they do is, therefore, not nearly so severe as is the case with the blood-suckers.

Some of the parasites—all lice and some mites—live permanently on their hosts, while others—fleas, some mites, and ticks—go to and fro. Some live entirely upon the skin, deep amongst and at the root of the feathers; some live like ticks, with their heads against the skin, and their bodies erect; while another sort live between the barbs of the feathers; and all are encouraged to live by dirt. The poultry flea is abundant in dirty fowl runs, particularly

those of a sandy nature, and in filthy nests; they are devoid of wings and provided with sharp, piercing mouths, and go only on their hosts to feed.

These parasitic infestations of poultry cause far more loss than breeders imagine, from the fact that when fowls are kept in large numbers, the owners rarely examine them by handling, and the cause of their lack of thriving and poor condition is rarely considered or ascertained. The evil is thus allowed to spread unmolested, general unhealthy conditions resulting. Parasites of one or two sorts are most injurious to young chickens and broody hens, and are the frequent cause of a hen abandoning her eggs, and the failure to bring out chickens is frequently due to the irritation caused by these pests; while it is nothing unusual for broody hens to die on their nests through being robbed of their blood, and even when death does not result, the constitution is frequently so weakened as to cause predisposition to other diseases. The external lice of fowls is entirely different from those found on the turkey, the guinea-fowl, or aquatic birds, and any one of the varieties peculiar to one bird will not live on the other, and all are distinguished from the mites by having six legs, the mites having eight; the junior ones, however, of the latter manage to hobble along on six legs, a pair of hind ones developing later in life. Different species of the vermin are partial to particular parts of the bird's body, the favourite parts being the rump, around the vent, and under the wings, while a destructive variety, sometimes called ticks, are frequently found on the heads and necks of chickens a few hours after hatching.

While several varieties of lice live almost permanently on particular places of the fowl's body, there are one or two sorts of a wandering nature, and visit all parts alike, but are found more abundantly on the skin of the abdomen and amongst the fluffy feathers there.

They occasionally leave one fowl for another, can be found on the roosts at night, and have even been seen on the walls of badly-infested poultry buildings, and occasionally attach themselves to the persons who may handle the fowls. Lice are, by some, supposed to suck the blood of the victims. This, however, they do not do, but bite and chew the feathers and scales of the skin. They cause violent itching by biting, and must produce severe pain to the fowls when they are numerous. Anyone searching a fowl's hackle, prior to moulting, will usually see small notches eaten out of the feathers, and frequently a large number of the hackle feathers have been eaten off close to the skin, all of which has been done by the lice during the period from the fowl's previous moult.

All the lice breed rapidly, the eggs being laid upon the down of the feathers, and they are said to hatch out in from eight to ten days, and immediately begin to crawl about and harass the birds. These and other external parasites are usually found in dark, dirty, and ill-ventilated houses; damp also contributes to their propagation, and all flourish best on unhealthy fowls. Every adult fowl is more or less lousy: some poultrymen say they keep their fowls free from them. This, no doubt, is true; but this freedom is not absolutely so, as some of the vermin are so very small as to escape detection. At the same time, when they are kept in check to a moderate

extent lice are not of such danger as the other external pests, and when the fowls are healthy, kept in clean houses and runs, and supplied with a dust bath, they will keep themselves comparatively free; and should, under these conditions, one or two be found on the fowl's body, such need cause no alarm.

Mites are the most dangerous of the external parasites, from the fact that they are blood-suckers, and of the several varieties, what is generally known as the red mite is the most to be dreaded. They live and breed in the cracks of the roosts, and crevices in, under, and about any building convenient to the fowls, are most partial to the roosts, and are frequently found in masses under heaps of accumulated fowl droppings. Mites do not live on the fowls, but visit them at night in myriads, and suck their blood.

They are of grey, brown, or dark colour, but when filled with the fowl's blood they become red. They are able to live a long time without food, and have been found in old poultry houses, twelve months after the fowls had been removed. It is to the sitting hens they do most harm, particularly in the hot summer months, this being one of the reasons why some poultrymen cease hatching in October. When the sitting hen has become infested with these parasites, they are literally in millions, and have been found in handfuls beneath the nesting material and eggs; the latter become spotted with the filth from them, and in pronounced instances the hen is a mass of living vermin. The head and eyes become covered with them, and she frequently dies through emaciation due to loss of blood.

In cases where the mites are not numerous enough to cause the hen's death or to be responsible for her abandoning the eggs, as soon as the chicks are hatched, numbers of mites leave the hen and attach themselves to the young chickens, swarming around their heads and eyes in myriads, and when examined are full of the young chicken's blood. In these instances, if the pest is not immediately arrested it is responsible for the death of their perhaps but day-old hosts.

Fleas are perhaps the least dreaded enemy of the poultry yards, still they have been seen in hot sandy runs, houses, and other places where the fowls frequent. Species of them feed upon the fowl's blood, and precautions should be taken against them. The fowl flea, like the fowl mite, is termed a partial parasite—that is, it goes only to its host to feed, and for this purpose has a sharp, piercing mouth. From the fact that they only feed at night, they are rarely noticed on the fowls, but they are the cause of much irritation and loss of blood.

The female flea lays her eggs amongst the dust and dirt and in the cracks of walls and roosts; and entomologists tell us that the nits of the flea develop into small white maggots, and pass through several stages before they become true fleas. They breed all the year round, but mostly in warm weather.

All the lice breed rapidly. The eggs are laid upon the downy feathers and hatch in six or eight days. They live a considerable time, and can be kept alive on fresh feathers. The illustration is that of one which lived for several days after removal from the chicken, and had no food whatever.

Remedial.

Mites, as has been said, are the worst form of external pests, but owing to their depredations being done at night, they are rarely noticed until they have become so numerous as to seriously affect the bird's health, or they may be first discovered when a visit is paid to the broody hen to test her eggs, the vermin soon becoming apparent on the hands of the person handling her. When it has become known that there is an infestation, the first thing to do is to make a complete clearance of every internal fitting of the house—perches, boxes, or aught else should be removed out into the poultry-yard and given a thorough painting with kerosene, and repeated the second day. The inside walls of the house should then be given a good brushing down with an old kitchen broom, then a thorough painting with kerosene, to be followed with a coating of whitewash to which has been added, say, 1 pint of crude carbolic to each gallon of the wash. Should the poultry-houses be extensive and kerosene be considered too expensive, an emulsion of such will be effective, viz., 1 gallon of kerosene, 1 of water, and 1 lb. of soap boiled together for about half an hour. One authority recommends for a wash for the house and fittings a decoction, made by boiling 4 ounces of tobacco in a gallon of water. The writer has tried this and found it most effective. A generous application of crude carbolic is another excellent remedy. A cheap quality of this can be procured, and a good way to apply it is with a garden syringe, which will drive it into every crevice of the house, and what runs down the walls on to the floor of the house will be equally useful there. A crude petroleum can also be had cheaply, and is as effective as the finest kerosene.

Lewis Wright on this subject says:—"The red mite lives mainly in the crevices of house and roosts, coming out at night to feed on the birds. It is naturally white, but becomes red when fed with blood. The eggs are seen in crevices, especially where ends of perches rest, as white dust. All should be removable, and the surfaces of such places washed daily with kerosene. This and frequent carbolic lime-washing and removal of manure will be effectual. The following is a cheap and easy method of preparing carbolic wash. Boil ½ lb. of soft soap in 3 quarts of water, and while still boiling hot agitate with it a quart of the crude carbolic acid. Keep this corked and labelled 'Poison,' and when a wash is wanted mix a pint with a bucket of water, and syringe with it freely. Another wash quite as good is made by shaving up 1 lb. of yellow soap in 3 pints of boiling water, keeping hot till all dissolved. Then remove from the fire to avoid danger, add 3 pints of kerosene and a gill of crude carbolic acid, and agitate briskly for fifteen minutes, which will make a creamy emulsion. When well emulsified add 12 quarts of weak soap solution and mix well. This is to be sprayed freely over the interior."

Any of the above mixtures will be effective in abolishing the mites, but one of them must be occasionally used to keep the places free; this, however, can be easily done. Perhaps the simplest of any for the perches is to give them a painting once a month with a cheap liquid known as coal-oil. At the late

Rockdale egg-laying competitions this was used occasionally, the supervisor attributing the cleanness of the fowls throughout the two years' tests to this simple preventive. The above remedies, however, apply to the vermin mites and fleas only. These visit the fowls for their food, but do not live on them.

Lice are of less consequence, but dangerous withal. A vermin-infested hen will not lay well, and, it has been said, will not hatch well, frequently leaving the nest before the eggs are due, and, what is nearly as bad, should she hatch them, lice are immediately transmitted to the chickens, many of them dying from the effects. Lice, however, are more easily exterminated than the mites, a few dustings with one of the many insect powders being effective. Pyrethrum powder is the best, and it is said this forms the basis of many of the insecticides. Tobacco dust, which can be had in Sydney for as low as 3d. per pound, is also most effective, and a handful of this placed in the setting hen's nest, and another handful added when within a week of bringing out her chicks will keep her free from these irritating pests. Another good dusting powder is 1 oz. of 90 per cent. carbolic acid to a peck of fresh air-slaked lime, and stir thoroughly. In using dusting powders, the simplest way is to spread out a newspaper; hold the hen by her legs, with the body and head hanging down; the powder can then be worked into the feathers down to the skin. The struggling of the hen will assist in working in the powder, and what falls on to the paper can be used again. Indeed, to be effectual, there should be two or three dustings at intervals of a week.

If the fowls are healthy, the premises kept clean, and a dust bath of ashes provided, lice rarely get the upper hand, it being through the brood hens transmitting them to the chickens that most harm ensues. A hen with many or few lice on her when sitting transmits them to the chickens immediately they are hatched, and remarkable to tell, they do not wander over the chicken's body, as on the hen, but are to be found stationary on the chicken's head, above the beak and eyes, and in a few days, when they get more plentiful, are to be found behind and on top of head and throat. They are difficult to find, the best plan being to take the small blade of a pocket knife, and separate the fluff or small feathers at the top of the head or near the beak, and they will be found deposited there, frequently with their heads buried into the skin; such an unusual thing for lice, that they have been termed chicken ticks. Mr. E. Cobb, F.Z.S., for a long time on the staff of the *Feathered World*, England, in his book on the rearing of chickens, says:—"This insect, which we have failed to discover a mention of in any work on poultry, somewhat resembles the sheep tick, a by no means unfamiliar object amongst sheep-breeders. Its habits are also very similar to its more developed cousin, for in each case does it bury its head into the flesh of the animal or fowl, and in pulling it away the body will at times separate and leave the head still embedded in the flesh. When taking some off in order to examine them while alive, the chick has often called out in evident pain. They suck the very life blood from the youngsters, and we have no hesitation in saying that the primary cause of nine out of every ten deaths in young chicks is caused by

these ticks. For it can readily be understood that if the chick is infested with a number of these insects, all living by the suction of its blood, its system is lowered and its blood is poor, and that the first chance it has of taking roup or other disease will not be missed, and being almost exhausted by its previous troubles it quickly succumbs, and the real cause of its dying is often lost sight of. In the first place ticks, unless in very great numbers, are exceedingly hard to find. We mention this to show how careful one must be in order to detect them, and that if one in a brood is discovered with any, it may be taken for granted all the rest have some. Ticks generally make their appearance when chickens are from one to three weeks old, and they collect only on the head, neck, and throat of the bird. The hatching ground for ticks is on the front of the head, close to the base of the upper mandible of the beak; there the eggs will be found deposited, being of a whitish colour, and much longer than they are broad. When the tick hatches it removes towards the back of the head, and as it increases in size goes down the neck and under the throat, and the largest and most developed ones will usually be found at the base of the ear. Insect powder we have found to have little or no effect in killing ticks. Salad oil, or any other oil, will kill the ticks, but does not destroy the eggs. Paraffin will not only kill the ticks and eggs, but the little chicks as well. The following is a simple recipe, and will be found effective in destroying the eggs. Take three-quarters of a cup of water, and when boiling pour in a quarter of a cup of paraffin, stir well together, and let it boil for 2 or 3 minutes; remove to cool somewhat, and continue to stir whilst applying it to the chickens. Take the chick in the left hand and let the head be placed between the two first fingers, and in this way the neck can be extended. Then with the right hand dip a finger into the solution and anoint the head, neck, and throat of the chicken. Do not saturate it, but at the same time see that all the fluff has a little put on it right down to the roots. In a week or ten days the chickens should have another application of the mixture." There are many other remedies for these lice or ticks, but the simplest and at the same time effective treatment is to place a small quantity of salad oil in a saucer, and the day after hatching dip the finger in the oil and thoroughly rub it into the fluff of the chicken's head and under throat. This will kill the ticks (if any), and if repeated the second or third day there will be little fear of any escaping. When a week or ten days' old the chickens should be again examined, and if any of the vermin are found at this age a little kerosene can be added to the salad oil. It is best to anoint all chickens with the oil only immediately after they are hatched, such being a sure preventive of the scourge.

In addition to the above parasites, there is the scaly-leg mite and the poultry tick. The former has been exhaustively dealt with by the present writer ("Scaly Leg": Miscellaneous Publications, No. 945), and the latter equally so by Mr. Froggatt ("Notes on Fowl Tick": Miscellaneous Publications, No. 931). Reprints of both can be had on application to the Director of Agriculture.

(*To be continued.*)

The Influence of Bees on Crops.

[Continued from page 613.]

ALBERT GALE.

POLLEN is the vital agent in the production of all fruit crops, and also the life-cell in the reproduction and perpetuation of all phanerogamic plants, *i.e.*, plants having conspicuous flowers, has already been shown. In this division of the vegetable kingdom it has been pointed out that reproduction is the result of a union between ovules and pollen grains, the former being the cells of matter, and the latter the life-cells. The methods or agents employed by nature to bring about this union in plant-life are various. In nearly all of them, excepting that of the union that is produced by insects, it is extremely haphazard. Indeed, the union that is brought about by other insects than bees is almost as fluctuating as that of other agencies, such as wind, &c., if we except the bee family, and this family must be gradually narrowed down to the hive-bee as the one *par excellence* in the art of fertilisation in the production of crops that are useful for food or otherwise to man. In the majority of entomophilous plants it is almost impossible for fructification to take place but by contact with an outside agent, and the only agents designed by nature by their construction, instinct, and their domestic requirements are members of the bee family. In all parts of the world there are many thousands of species and varieties of insects. Yet out of this vast army of unique and, in some instances, grotesque forms, having peculiarities adaptable for the life they have to lead, and for obscuring themselves from enemies by resembling the plants, &c., upon which they live, the only ones that collect and store pollen are bees. When other insects carry pollen it is entirely accidental. Bees cannot live without it. It is their bread of life. Their young cannot be nursed to maturity so as to perform the active duties they have to follow without it. In the insect world there are artisans in paper-making, in spinning, in weaving, in basket-making, in house-building, in masonry, in sawing, in carpentry, in upholstering, &c., each of them having tools or instruments specially suited for carrying out the work Nature has intended them to perform; but the only ones having instruments and appliances for gathering, carrying, and storing pollen are bees. Pollen is removed from the anthers and conveyed to the receptive organs of flowers by every variety of insect that alights on them during the time the pollen is distributive. By reason of the viscid nature of the pollen grains of most entomophilous flowers it adheres to the body or legs of any insect that may by chance walk

over it, and is conveyed by them elsewhere. If it were brought in contact with the pistil of a flower of its own variety, the act of fertilisation would be as efficacious as if it were carried by bees; but these cases are purely accidental, and the successes are only "few and far between." Not so with the bee. Every movement of the bee in the direction of fertilisation is a studied one designed purely by Nature to accomplish the perpetuation of the plant it is at work upon. The anthers of some flowers are so situated as to discharge the pollen only on some very particular spot of the external anatomy of the bee—her head, upper surface of the thorax, chest, tongue-sheath, &c., and the stigma is so placed in the flower that only that portion of the bee that has received the pollen would be capable to effect the purpose.

I have used the term bees (*Apidæ*) frequently to indicate any member of that extensive family, but all or every variety of bee although both honey and pollen gatherers, are not capable of general fertilisation. It is only the most highly developed bees (humble bees and honey bees) that are furnished with apparatus suitable for collecting and carrying pollen from flowers of *all* forms or designs. Mason bees and leaf cutters (*Osmia* and *Megachile*) have the ventral surface of the abdomen furnished with long stiff retroverted hairs. These hairs by pointing the "wrong" way brush the pollen from the anthers as the insects pass in and out of the bloom. Grains of pollen become entangled among them, and by this means they are transported elsewhere; the hairs on the abdomen of such insects are beautifully adapted for the fertilisation of flowers having a broad and flat corolla, and the reproductive organs being protuberant or conspicuous. If the female organ be hidden low down in the long narrow tube that some blossoms possess, such as clover, &c, they are utterly incapable of performing the uniting ceremony required to produce a fertile seed.

If the hinder legs of one of the hairy bees, a young one especially, because they are more furry than the older ones, be closely examined when returning home, it will be noted that they are thickly bespangled with grains of pollen, to be afterwards transferred to the pollen baskets; it is these stray grains of pollen attached to the hairs that are utilised in pollinating the receptive organs of blossoms. The hairs on the hinder legs of one of the humble bees (*Bombus terrestris*), the arrangement of the pollen-gathering hairs, are carried out with greater perfection, but the hairs are distributed in the same irregular manner as in the hairy bee already referred to. In the ordinary honey bee (*Apis mellifica*), the pollen-collecting hairs are much better adapted to their designed use than is the case with the two former. The hairs on the tarsus of the legs are arranged, not in the irregular way as is the case in that of the humble bee, but in eight or nine regular rows. This regularity of the arrangement of the hairs of the pollen-brush enables our domesticated bee to brush the grains of pollen from the anthers far more effectively than is the case with any other member of the whole species. Whilst she is at

work on the flowers, and also in mid-air, she is constantly transferring those grains to the pollen baskets, but *all* are not stored therein; some escape, and it is these escapees that do the work of fertilisation.

I think I have pointed out clearly that there is no insect so highly developed for carrying the imperatively essential pollen from flower to flower as the hive-bees. Their intelligence, their energy, their social habits, and the ease with which they are kept under control stamp them at once as no mean ally to the tiller of the soil. The practical beekeeper in any district is a confederate that should be welcome to all. The indiscriminate destruction of native honey-producing flora should be carefully avoided, because most of the plants that I have referred to in these articles are exotics, and these, as a rule, bloom in the early spring and the pollen and honey obtained therefrom is used in the spring and summer for the raising of young brood. The stores gathered from indigenous summer and autumn flowers are to carry them over the severity of the winter. If there be not sufficient storage when the cold and wet season sets in to carry them through till springtime it will cause an insufficiency of bees to do the work nature has assigned for them, and the result will be a lesser ingathering of the fruits of the tillers' labours. Landowners and others cannot have the remotest idea of the mischief they are doing to the vegetable kingdom, and therefore to mankind, by the wholesale destruction of our native flora. If these are wholly, or nearly wholly, cleared from the land to the extent of giving insufficient winter storage for our bees so as to decimate them to the extent of their numerical inability to carry on the necessary work of fertilisation the result will be more disastrous than droughts or floods to our fruit trees, because these would cease to yield their crops.

The sons of our agriculturists and others engaged on the land are instructed in pruning, grafting, budding, and other concomitant adjuncts for obtaining a living from the soil, but none of these are more necessary than an acquaintance of bee-management—the practical part of it at least. Apart from the profits from the sale of the honey, or that used in the home (there is no food more healthy and invigorating), the presence of bees on a homestead are as necessary as the implements of husbandry, nay indeed more so.

There is yet another phase of this subject I intend to deal with. In previous articles I have confined myself to the influence of bees on fruits; in those remaining, I intend dealing with them as florists.

It has been advocated by the very highest scientific authorities for the Darwinian theory of the development of species in the vegetable kingdom, that colours and perfume of flowers have been produced chiefly, if not entirely, by the visitation of bees and other insects—that our brightest coloured flowers have been developed from progenitors of inconspicuous tints, and the highly attractive shades of the blooms of to-day are the result of the showy character of a less-favoured, as regards colour, earlier

race. The same is also said to be the reason of our highly-perfumed blossoms; and these two qualities of flowers—colour and perfume—remain dominant as attractive agents to insects. It is further said that the development of colour and perfume has had the effect of educating the visual and olfactory nerves of these insects (bees) in their search for flowers of particular colour or perfume to supply them with their daily bread, whilst they pass over those of a less gaudy colouring unheeding. Again, that the markings in the throat or tube of other flowers act as finger-posts or guide-marks to point the bees in the direction they should take to discover where the nectar is situated that contains their food supply. (See "*The Story of the Plants,*" by Grant Allen, "*Cross and Self-Fertilization,*" by Darwin, and others.)

I am not going to attempt to prove that bees have not had an influence on the plant world; I have already acknowledged it elsewhere. Neither am I going to try to disprove that they are not cognisant of both colour and perfume; but that some colours and some perfumes are more attractive to bees than certain others does not in any way accord with my experience and years of observation.

I know that highly intellectual scientists of undoubted veracity have applied numerous tests, and given the results of their observations to the world, to prove that colours and perfumes are the chief signs that act, like the Southern Cross to the mariner, as indicators for bees to steer by in their peregrinations for the discovery of both pollen and honey. It has been conceded again and again that the tests and their results were unfailing proofs of the correctness of these suppositions, *i.e.*, that flowers of very inconspicuous colours, markings, and shapes have developed into the bright and showy colours and forms they now possess that are so attractive to the cultivated eye of lovers of the plant world.

Sir John Lubbock, in "*Bees, Ants, and Wasps,*" referring to the colour sense of bees, says: "The consideration of the causes which have led to the structure and colouring of flowers is one of the most fascinating parts of natural history. Most botanists are now agreed that insects, and especially bees, have played a very important part in the development of flowers. While in many plants, almost invariably with the inconspicuous blossoms, the pollen is carried from flower to flower by the wind, in cases of almost all large and brightly-coloured flowers this is effected by the agency of insects. In such flowers, *the colours, scents, and honey serve to attract insects*, while the size and form are arranged in such a manner that the insects fertilise them with pollen brought from another plant." The *italics* are mine.

Whilst I am writing I have before me in the garden the white Arum lily (*Arum africanus*). A few weeks ago its white pollen was eagerly sought for by bees. At the same time the broad beans were in full bloom. These, too, were an attractive foraging-ground for the same insects. Since then the peach-trees have burst into flower, with the result that the

first-named is entirely forsaken, and the second receiving only an occasional visit. Have the bees gone to the peach-trees because of their attractive colours? Not a bit of it. While the peaches are in flower so are the willows (*Salix babylonica*) just throwing out their catkins. The bees are now bringing in pollen of two colours, one creamy white and the other somewhat of an orange tint. I note that in this (Stanmore) district there are roses, marigolds, Arum lilies, and other attractive flowers in full bloom, but few bees are visiting them. The pollen is coming from the willows and peach-trees. There is also honey coming from the latter. The flowers (catkins) on the willow are so inconspicuous that a large number of people are ignorant of the fact that they are phanerogamic; yet they are as attractive to the bees as the gaudy peach blooms. A few days ago I visited the Sydney Botanic Gardens. At the time of my visit the most attractive beds of flowers were daisies, pansies, anemones, and the turban ranunculus. Nothing in the Gardens was more showy than these latter, yet no bee visited them. Near was a shrub (*Buxus simpervirens*) in which there was a constant hum. What was the cause? Hidden among the foliage there were some small greenish flowers, supplying abundance of bee food. If colour had been their guiding star they would never have found it in the shrub—they would have searched the ranunculus beds; and there they would have searched in vain. But who will say the attractive *colour* was not there?

When I found the bees had forsaken the Arum lilies and broad-beans for the peach and willow trees, I tried to induce them to return to the first-named by offering them large bribes. I covered the essential organs of the lily with pure honey; but no bee visited them, and finally the bribe was carried away by ants.

It is more than doubtful if bees are attracted to flowers by their colours. Bees can distinguish colours and objects. The tests supplied by Sir John Lubbock on this point are interesting, but do not go to show that the bees are attracted by the colours in flowers. He says "bees have played a very important part in the development of flowers." (*Read the whole quotation on previous page*). "I thought," he says, "it would be desirable to prove this, if possible, by actual fact. . . . I brought a bee to some honey which I placed on blue paper, and about 3 feet off I placed a similar quantity of honey on orange paper." [*Note*, his experiments were carried out with paper covered with honey, not with flowers.] "The bee carried away a load of honey and returned to the same blue paper twice." He then transposed the papers, and she made three more visits to the same coloured paper. On the following day he again transposed the colours. The bee "returned to the old place, and was just going to alight, but observing the change of colours, without a moment's hesitation darted off to the blue. No one who saw her at that moment could have entertained the slightest doubt about her perceiving the difference between the two colours." Yes; because she had learned it was the blue paper that gave her food. The bee was working by sight, exactly

upon the same lines as the highly intellectual man acts. If there be two cupboards or safes of two different colours in a room—a blue one containing his food, and an orange one his papers—if their positions are frequently changed he goes into the room and looks for the one, by its colour, that contains the food or papers he may require; but if he had been accustomed to find the blue safe in the room in the same position, he would enter the room and would be about to open it, "but observing the change of colours, without a moment's hesitation" he too would "dart off to the blue," and "no one who saw him at that moment could entertain the slightest doubt about his perceiving the difference between the two colours" of the safes. It was not the colour that attracted the bee; it was the food. Notwithstanding the transpositions of colour, as soon as all the honey had been used up, the orange or other colour would have been just as attractive if bee food were placed on it.

On one occasion I saw a bunch of flowers that had been brought from a distance thrown out on a rubbish heap. It was early spring, and at the time bee food was very scarce, especially pollen. There was a good store of honey within the hives; there was also young brood; therefore, pollen was needed. As soon as the bees saw these discarded blooms many of them were "just going to alight," but observing there was no food they hastened off to the inconspicuous flowers of the couch grass, upon which they had been at work for several days, because there was nothing else at that time supplying them with pollen that was so essential for the young brood.

(To be continued.)

Weather Conditions during September, 1907.

A. NOBLE,
Meteorological Department, Sydney Observatory.

THE month started with a high pressure centrally situated over South Australia, and a shallow "Low" to the S.E. of New South Wales. These conditions resulted in a few widely-scattered showers over our State; frosts also were recorded on the northern and southern tablelands. On the 3rd, light showers fell at a few stations in the Hunter and Manning—chiefly coastal—the result of a southerly squall during the night. On the 6th, an energetic low pressure controlled weather over New South Wales and Victoria, with the result that strong and dry "north-westers," with high temperatures, ruled throughout our State. On the following day a "Low" appeared to the south of Cape Leeuwin, and moving rapidly eastward, resulted in the first rain of any importance for the month. The falls, though fairly general, were only light to moderate, the best records being about the Blayney district, where as much as 118 points were recorded. On the 10th and 11th, light showers were recorded in eastern Riverina, south-western slopes, and southern highlands, the storm by this time having moved to the Tasman Sea. On the 12th, a few light showers fell at scattered places on central and southern coast. During the period between the 13th and 24th, no rain whatever fell in any part of New South Wales. Hot and dry conditions prevailed throughout from the 21st to 23rd, when a low pressure appeared, extending from West Australia to Victoria. This disturbance broke the long spell of dry weather, the rain starting in the S.W., and moving east and northwards covered the whole of our State with the exception of a few stations in the far N.W., north coast, and northern tablelands. The heaviest and most consistent falls were registered over the southern half of the State, and many falls approaching or exceeding an inch were recorded over the western slopes as far north as Forbes. On the 26th, light showers were recorded over the Upper Barwon tributaries, north highlands, and parts of north coast; frosts were also recorded over parts of southern districts. On the 28th, a few light showers fell on the south-western slopes and in eastern Riverina.

The lowest temperatures over the State were recorded on the 14th, when 13° were registered at Kiandra, and the highest on the 24th, when Bourke had a registration of 99°.

The following statement shows a brief comparison of the chief meteorological elements over India together with Australia, as far as data are available, for the month of September, 1907 :—

	Departure from normal.		General Conditions (referring to State as a whole).
	Pressure.	Temperature.	
	Inch.	Degrees.	
India...	+ ·01	+1·9	Very deficient.
Sydney	+ ·05	+2·6	Very dry.
Melbourne	− ·03	+1·6	Dry.
Adelaide ...	− ·02	+3·0	Very dry.
Perth	+ ·02	+0·4	Below normal.

The above table shows some interesting coincidences. The temperature has been considerably above, and rainfall considerably below, normal over both India and Australia during last month. No data are yet available to show how other regions surrounding the Indian Ocean have been affected.

Pressure has been above average at both Sydney and Perth, and below average at the more southern capitals, which shows that anticyclonic conditions have prevailed inland away from the southern parts of the continent, whilst the southern shores have been swept by a succession of low-pressure systems. The difference in barometer grades also suggests that fresh to strong westerly winds have held sway over the southern parts of the continent, dry winds blowing out of the anticyclonic conditions over the interior of Australia.

During last month there was again a great deficiency in rainfall over the whole of our State. The greatest defects, approaching 100 per cent. below normal, extended over coastal and northern areas, where at many stations absolutely no rain fell.

The distribution over the various subdivisions was as follows :—

Division.		Percentages. Above normal.		Below normal.
Over North Coast ...	from ...	—	...	96 to 100
,, Hunter and Manning	,, ..	—	...	53 ,, 100
,, Metropolitan area	,, ...	—	...	88 ,, 95
,, South Coast	,, ...	—	...	40 ,, 100
,, Northern Tableland	,, ...	—	...	53 ,, 99
,, Central Tableland	,, ..	—	...	4 ,, 85
,, Southern Tableland	,, ...	—	...	16 ,, 91
,, North-western Slope	,, ...	—	...	66 ,, 97
,, Central-western Slope	,, ...	—	...	38 ,, 55
,, South-western Slope	,, ...	—	...	12 ,, 58
,, North-western Plain	,, ...	—	..	70 ,, 100
,, Central-western Plain	,, ..	—	...	10 ,, 100
,, Riverina	,, ...	36	to	70
,, Western Division	,, ...	15	,,	100

Seasonable Notes.

GEO. L. SUTTON,
Wheat Experimentalist.

THE special ability of some of the macaroni wheats to resist drought is shown by the appearance of varieties belonging to this class now growing at the Moree and Coolabah Experimental Farms. At Moree, some thirty varieties of bread wheats, owing to the severity of the drought, present such a burnt-up appearance that they can only be regarded as failures, even for hay. In marked contrast to this, "Medeah" and "Cretan," the only two macaroni varieties growing there, present a fresh, green, and vigorous appearance. At Coolabah, in the late planted section, the macaroni varieties are not yet showing signs of distress, whilst the bread wheats are beginning to burn off as the result of the continued hot, dry weather.

Grown under the dry conditions prevailing this season, the macaroni wheats are of medium height, so it is evident that when grown under semi-arid conditions, a superabundance of straw, which in more favoured districts of liberal rainfall is an objectionable feature of these wheats, need not be feared; even under these conditions the beards are long enough and harsh enough to render the bearded varieties unsuitable for hay, but if made into ensilage the beards would not prove objectionable.

There are some farmers who refrain from cutting crops intended for hay until the grain in them is well formed; this practice is not in accordance with sound business principles, and should be changed. Hay made from a crop well advanced towards maturity is neither as attractive, as palatable, nor as nutritious as hay made from a crop cut just after flowering; and in the best markets "grainy" chaff never makes the same money as a bright green sample containing no grain, for users find it less nutritious and less economical than the bright-green kind, which can only be made from a crop cut before the grain is formed.

A crop intended for hay should be cut just after flowering, and whilst the grain is still soft and watery, for at this stage the whole of the nutriment contained in it is evenly distributed throughout the plant, and, seeing that the whole of the plant cut for hay is to be eaten, it is obviously an advantage to have it thus evenly distributed, rather than to have it distributed unevenly so that one portion of the plant is exceptionally rich and the other portions exceptionally poor, as is the case when the plant is harvested when well on towards maturity. Once the head is fairly formed the nutriment contained in the plant becomes concentrated in the grain as it ripens, whilst the stalk becomes more fibrous, less nutritious, and less digestible.

This season's summer crops are likely to have an increased and special value on account of the partial failure of the winter crops; those who have

been able to plant them should endeavour to stimulate their growth to the fullest extent by harrowing the broadcasted ones and by cultivating the ground between the rows of those which have been drilled. As the immense value, in a climate like ours, of intertillage (*i.e.*, the cultivation of the ground between the rows of drilled crops) is thoroughly realised, the practice of broadcasting summer crops will give place entirely to the method of planting them in drills, sufficiently far apart for intertillage to be economically and expeditiously carried out. Intertillage cleans the ground by destroying weeds, it stimulates plant growth by liberating dormant plant-food, and, by conserving the precious moisture, enables the plant to make the most of the rainfall.

Contrary to the popular impression in some districts, the yield from drilled crops is invariably greater than from broadcasted ones, even in districts having a copious rainfall, and, in addition to this, it is now recognised that drilled crops which have been cultivated are more nutritious than broadcasted ones.

Ophthalmia (or Eye Disease) in Sheep.

R. W. PEACOCK.

Ophthalmia in a severe form affected the sheep at this farm during the winter. It affected both ewes and lambs. The inflammation in several cases did not confine itself to the eyes, but affected the whole system, several deaths of ewes and lambs occurring. Ninety-four per cent. of lambs were marked. Five per cent. died owing to the disease. The wool of the badly-affected ewes would peel off freely upon catching hold of it. These were treated successfully by giving each sheep 1 oz. of Epsom salts with 1 tablespoonful of treacle, which reduced the inflammation. All the eyes were treated with the following mixture:—

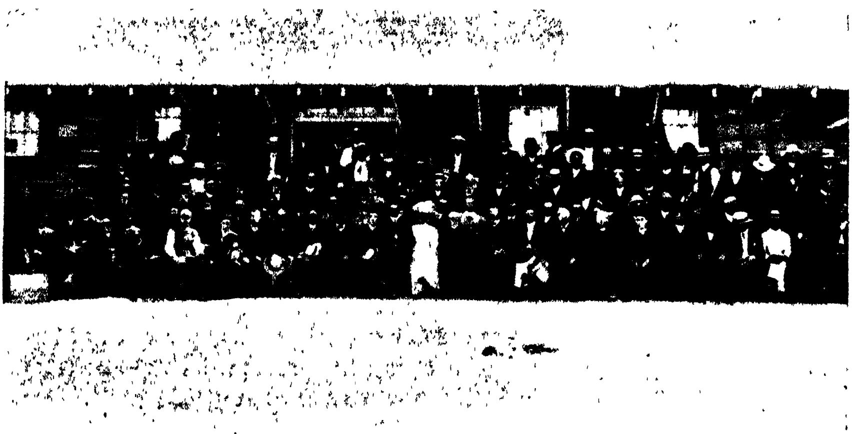
3 drachms of zinc sulphate.
1 oz. of laudanum.
1½ pints of water.

It is wise to boil the water to destroy any impurities. This was sprayed into the eyes by means of a bulb spray. Boracic acid was also used. The zinc lotion proved superior. For opacity of the cornea (or dense scum over the eyeball) a solution of 2 gr. of silver nitrate to 1 oz. of distilled water, applied with a camel's-hair brush once a day, proved successful. I am indebted to the Stock Department for the recipes for eye lotions.

Export of Apples grown in Government Orchard.

W. J. ALLEN.

EARLY in December of 1906 it was apparent that unless something unforeseen happened we were going to have heavy crops of apples all over the State; and as a good many young orchards were being planted, I thought it would be a good idea to test the Old Country markets in order to find out how our fruits would carry, also to ascertain how they would compare with fruits from other parts of Australia with which they would have to compete. On the 3rd of December, 1906, the Minister approved of the following recommendation: "That, provided space can be procured in the cool chambers, we consider the advisability of exporting a few hundred cases—say, 300 each to Japan, Vancouver, and California, and



A group of visitors to Bathurst Orchard to inspect apple trees prior to crop being picked for export.

500 cases to London." After making inquiries from the different shipping companies, we found that suitable space could not be secured to either Japan, Vancouver, or California unless we undertook to fill a compartment late in the season. This we were not prepared to do. The Oceanic Steamship Company asked 1d. per lb. gross for carrying fruit in their refrigerating chambers from Sydney to San Francisco—an exorbitant charge—while the Canadian Line did not quote a price. The China Navigation Steamship Company could only let us have space if we would take a compartment, and this we did not feel inclined to do. From Dalgety & Co. we had an offer to carry fruit to London at a very reasonable rate; but as it was considered that the P. and O. steamers would land our fruit there in a little shorter time, we accepted their offer to

send 500 cases by the "Mooltan," which sailed from Sydney on the 13th March, and a second 500 cases were despatched by the "Moldavia" on the 27th of the same month, all the fruit arriving in London in very satisfactory condition. The shipment by the s.s. "Mooltan" reached London before the glut of apples took place, and in consequence the prices obtained were exceptionally good; but those by the "Moldavia" arrived simultaneously with other large consignments, and as a result the fruit did not command such good prices, chiefly, it was claimed, from its not being a good bright colour. The only two cases which did not come under this category were two cases of selected Jonathans, which sold at 16s. 6d. per case, while such good-keeping apples as Granny Smith and Stone Pippin only brought 10s. 6d. to 10s. per case, because buyers did not like the colour, which is not bright red, but greenish, and some were a little too large; while Rome Beauties were not well coloured, and in consequence did not bring more than 9s. 6d. per case, excepting for two specially selected cases, which sold at 10s. each.

There were three cases of pears—two of Idaho, which sold at 12s. 6d. per case, and one of Kieffer's Hybrid, which sold at 11s. 6d. per case.

Packing-house at Bathurst Orchard.

There were a good number of broken cases in the two consignments, which averaged about 5s. per case.

The following are the prices obtained for the different varieties, viz.:—

Ex s.s. "Mooltan" (497 cases).

75 cases	Five Crowns, 9s. 3d. to 10s.	75 cases Stone Pippins, 9s. 6d. to 11s. 6d.
52 ,,	Munroe's Favourites, 12s. 6d.	72 ,, Jonathans, 12s. 6d. to 14s. 6d.
200 ,,	Cleopatras, 12s. 6d. to 13s. 6d.	——
20 ,,	Reinette de Canada, 9s.	514
20 ,,	Perfections, 8s. 6d.	

Ex s.s. "Moldavia" (497 cases apples, 3 cases pears).

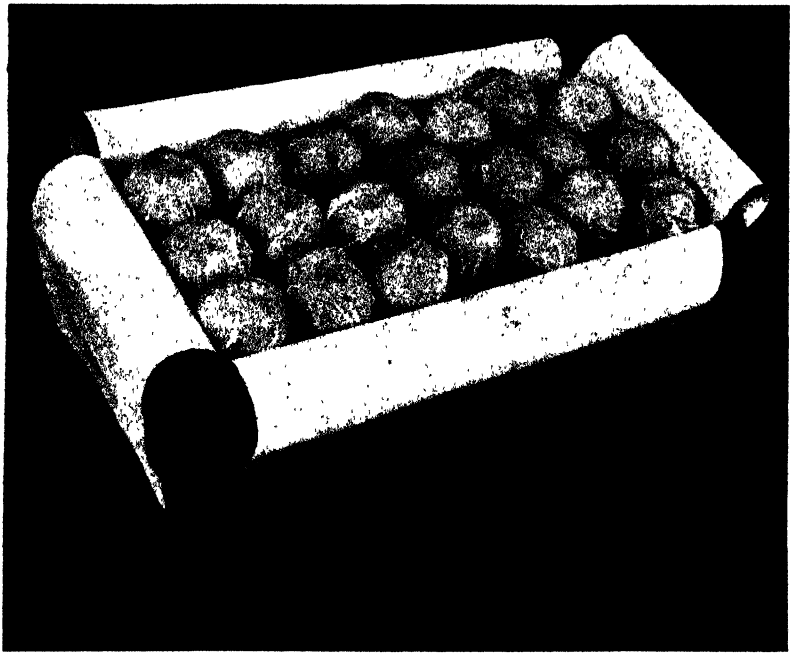
12 cases	Five Crowns, 8s. 6d.	2 cases Jonathans, 16s. 6d.
9 ,,	Munroe's Favourites, 9s.	2 ,, Idaho Pears, 12s. 6d.
195 ,,	Granny Smiths, 10s. to 10s. 6d.	1 case Kieffer's Hybrid Pear, 11s. 6d.
182 ,,	Rome Beauties, 9s. 6d.	——
97 ,,	Stone Pippins, 8s. 6d. to 10s.	500

That is, 1,014 cases sold in London for £534 12s. 3d.

The following is the cost incurred in packing and marketing same:—

	£	s.	d.
Shipping charges, Sydney to London, 1,014 cases, 65s. per 40 cubic feet ton—900 feet in the 514 cases, and 875 feet in the 500 cases	144	4	4
Insurance, about	2	2	0
Cartage from rail to steamer, Sydney	2	15	0
London expenses—lighterage, carting, brokerage, &c.	41	8	8
Freight, Bathurst to Sydney—22¼ tons at 15s. 6d. per ton	17	1	0
1,014 cases at 8d. each	33	16	0
Packing cases at 2d. each	8	9	0
Wrapping paper for 1,014 cases at 3d. each	12	13	6
Carting fruit, packing-house to railway station, Bathurst	1	0	0
	£265	9	6

which, being deducted from the prices realised in London (£534 12s. 3d.), show a net return for 1,014 cases in packing-house, Bathurst, of £269 2s. 9d., or, say, 5s. 3½d. per case.



Apples packed for export.

The following are the reports of the Agent-General and Messrs. Keeling and Hunt, the agents who disposed of the fruit, together with comments by the latter on the different varieties of apples and pears:—

Apples *ex* s.s. "Mooltan."

Offices of Agent-General,
123 and 125, Cannon-street, London, E.C.,
3 May, 1907.

Sir,

I have the honor to forward herewith a report furnished by Messrs. Keeling and Hunt on the consignment of apples *ex* s.s. "Mooltan," and advised in your letter of 19th March (A 07/3,409). From the detailed list

submitted it will be seen that, on the whole, the apples fetched excellent prices, and are considerably superior to the Tasmanian apples which were selling on the same day. Experts who saw these apples say that they give very great encouragement to those who grow them, and that the export business is a very promising one if apples of such quality as this can be sent. From the account sales it will be seen that the total net return amounts to £275 8s. I have received a cheque for this amount, which has been paid to the Government account at the London and Westminster Bank to-day, and the Treasury have been advised accordingly.

I have, &c.,
T. A. COGHLAN.

The Honorable the Minister for Mines and Agriculture, Sydney.

Monument Buildings, Monument Square, London, E.C.,
2 May, 1907.

Sir,

We have the pleasure to enclose account sales of your 514 boxes of apples *ex* "Mooltan," together with cheque for net proceeds—£275 8s.

We are glad to be able to report that the consignment was, on the whole, a very good one; but we will deal with each variety separately, asking you to remember that our remarks will be very critical, simply because we believe you want to know the facts. Under ordinary circumstances it would be quite sufficient to describe the whole shipment, in a general way, as excellent. We will take the varieties in the order in which they were sold:—

1. *Shepherd's Perfection.*—Bold, nicely-coloured fruit; but unfortunately a large proportion of the apples were afflicted with "Bitter Pit"—an absolute bar to good prices.
2. *Five Crown Pippin.*—Large and medium fruit, clean, rather green, and not quite sound.
3. *Munroe's Favourite.*—Another name for Dunn's Seedling; good quality, bright, but rather green; large and medium size, condition very good. Altogether an excellent sample.
4. *Cleopatra.*—Good fruit, rather green, nice medium size, bright and clean appearance. We have nothing but good to say about this apple; it is the most consistently satisfactory kind that comes to London.
5. *Jonathans.*—Another excellent sample—bright and clean and well coloured. In every way suitable for this market, on account of its beautiful appearance.
6. *Stone Pippins.*—A beautiful-looking green apple, of good size; but not such a favourite for eating, as there is a want of flavour in the fruit.
7. *Reinette de Canada.*—We regret to say that these apples were stale, shrivelled, and badly marked with "Bitter Pit." Under ordinary circumstances the variety is quite suitable for market purposes.

With regard to the packing, it was rather slack—more apples might in most cases have been put into the boxes. The wood-wool is excellent for preventing bruises. You ask us whether these apples are better than Tasmanians. We reply, undoubtedly, "yes."

Always at your service.

We are, &c.,
KEELING AND HUNT.

The Agent-General for New South Wales, 123 and 125, Cannon-street, E.C.

Apples and Pears *ex* s.s. "Moldavia."

Offices of Agent-General,
123 and 125, Cannon-street, London, E.C.,
24 May, 1907.

Sir,

I have the honor to forward herewith a report by Messrs. Keeling and Hunt with respect to the sale of 500 boxes of apples from the Bathurst Experimental Farm, *ex* s.s. "Moldavia."

As will be seen from the report, the condition in which this consignment of apples arrived was most satisfactory—indeed, when this fruit was viewed side by side with apples in the market from other places at the same time, the excellence of the packing and of the condition of the fruit generally stood out in conspicuous contrast. Owing to the excellent condition of this fruit, I

took the opportunity of buying in nine cases, viz., two cases of Granny Smith, two cases of Stone Pippins, four cases of Rome Beauties, and one case of Jonathans, to be placed in cool storage for the purpose of display at exhibitions. The fruit expert of Messrs. Lyons, who kindly undertook to have the fruit stored for me, reported that, taking them all round, these apples were superior in condition to almost any he had seen from Australia; and he was very much taken with the high quality of the Granny Smith, although he agreed with Messrs. Keeling and Hunt that the intense green colour of this apple is likely to react against it until its good qualities become more widely known.

I am sorry to say that the pears were not satisfactory. They were all too large for dessert purposes, and they did not arrive in good condition. Messrs. Lyons' fruit expert stated that he did not think they could be kept more than three or four days, as all of them were beginning to show large discoloured blotches. The pear that is likely to be most successful in this market is a medium-sized pear of the Bergamot type. Pears of this character from Australia are well known here, and bear a very high reputation.

The account sales of New South Wales and other apples sold on the same day are attached, and the gross return for the 500 cases was £237 13s. 9d., while the net proceeds were £217 15s. 9d., cheque for which has been received from Messrs. Keeling and Hunt, and duly credited.

I have, &c.,
T. A. COGHLAN.

Monument Buildings, Monument Square, London, E.C.,
17 May, 1907.

Sir,

We beg to enclose account sales of 500 boxes of apples, *ex* s.s. "Moldavia," together with cheque (£217 15s. 7d.), to balance net proceeds. With regard to the fruit, we can only say that the quality, all round, was very good; but the greater portion of the consignment was much too green in colour for market purposes. The London buyers always want showy fruit, and they will pay a much higher price for it. For instance, we had considerable difficulty in getting 10s. 6d. for the Granny Smiths; but the little lot of handsome Jonathans made 16s. 6d. This difference is almost ridiculous.

The Granny Smith apples were of really good quality; but some were rather large. The only thing against them was the intensely green colour.

The Stone Pippins were of very fair quality; but they were mostly green.

The Rome Beauty fruit was of good quality, rather small, but somewhat green.

The Jonathans were very handsome, but, as usual, rather soft.

The pears were very large and apple-shaped, rather bruised, and not quite sound. We are always a little doubtful about pears. If there are not too many on the market, they do pretty well; but the fruit is so tender, and there is always danger.

It is a matter of great regret to us that the prices are so much lower than usual; but you will understand how this comes about when we tell you that 180,000 boxes of apples have arrived in London in about nine days. These are the quantities:—S.S. "Palermo," 50,000 boxes, arrived 4th instant; s.s. "Ophir," 5,500 boxes, arrived 4th instant; s.s. "Telamon," 30,000 boxes, arrived 9th instant; s.s. "Sarpedon," 16,000 boxes, arrived 6th instant; s.s. "Moldavia," 32,000 boxes, arrived 11th instant. Before these could be sold we had the following here:—S.S. "Runic," 35,000 boxes, arrived 13th instant; s.s. "Miltiades," 12,600 boxes, arrived 13th instant.

To make matters worse, the "Palermo" brought so many cases that the cargo was not all discharged until about the 9th. So you will see that the market has practically been glutted since the 10th

These quantities are too much for the market, and consequently prices during the last week have seriously declined. London can take a good many cases of apples; but when once we get the supply in excess of the demand, it is disastrous.

We are, &c.,
KEELING AND HUNT.

To the Agent-General for New South Wales, 123 and 125, Cannon-street, E.C.

Orchard Notes.

W. J. ALLEN.

NOVEMBER.

IT is matter for extreme regret that droughty conditions still prevail, and a clear and cloudless sky does not give any indications of a speedy break up. On the eastern side of the coastal range we have experienced the driest winter and spring we have had for years, and, up to the present, those who have had crops growing among the trees for turning under as a green manure, have had some difficulty in ploughing.

Fruit Markets, Los Angeles.

It is rather early in the spring for orchards to be showing signs of distress, but it is a fact that, in a good many places, the leaves on the citrus trees are beginning to curl up already, and, unless rain falls at once, there will be an exceedingly light crop of these fruits for the coming year.

The conditions on the western side of the mountains where most of our apples are grown are not so bad, as there have been a few nice falls of rain, which have kept the land in condition for working. The apricot crop at Wagga promises to be light, but at the time of writing, apples and pears give promise of being up to the average in a good many places.

It is well to keep the cultivator going, so as to conserve as much as possible of the moisture which falls, as most of our fruitgrowers are dependent on good cultivation to carry them over such dry seasons—few indeed being so fortunately situated as to be able to irrigate when they would like to do so, during seasons such as the present. The plough should never be brought into requisition at this time of year, except perhaps in a very wet cool district; but the soil should be kept stirred to a depth of 4 or 5 inches with a good cultivator.

Summer pruning may be started this month, and it is well to go over and regulate the growth of all young trees, thinning and shortening back where required—that is where the tree is growing too thick—and pruning or pinching back, so as to keep the tree evenly balanced and symmetrical. This early summer pruning is more for young trees, to aid in directing the growth to that part of the tree where it is most required.

Where irrigation is practised, a thorough watering should be given to all trees towards the end of the month. This should be the second watering of the season. Be most careful to keep the water confined to the furrows, as, wherever the land is flooded, it is liable to become hard. As soon as the furrows are dry enough to work, cultivate the orchard twice, and loosen the soil around any young trees with a fork hoe.

Pruning of citrus trees may be continued wherever not completed

Pruning and manuring of passion-fruit vines may be carried out the early part of this month.

Wherever Thorny mandarins show signs of cropping too heavily, it will be well to prune them a little more severely as well as removing some of the fruit from the tree so that the latter will not overbear and exhaust itself this season. If allowed to overbear, the fruit will be small and almost worthless.

Budding of citrus trees may still be carried on.

All citrus trees attacked by Maori or other fungus diseases should be sprayed with Bordeaux mixture. In applying a spray like Bordeaux mixture to citrus trees, it will be found advantageous to apply the mixture in a small quantity at a time, in two successive sprayings, rather than one heavy application, which may run off the surface of the young fruit.

Never fumigate trees for several months after they have been sprayed with Bordeaux mixture, as, if they are so treated, all the leaves will fall off; many of the smaller twigs, and occasionally the top part of the tree, will be killed.

In districts where the Fruit-fly has been troublesome in previous seasons, particular care should be taken to pick up and destroy all fallen and fly-infested fruits—and boil them—in order to ensure the destruction of all

larvæ which may be contained therein. As this is the only sure way at present known of helping to keep down this pest, I would urge on growers the importance of doing their best to destroy it.

Every care should be taken to destroy the Codling moth, which makes its appearance about the time the apple-trees finish blooming, lays its eggs on the young fruit and leaves; and after hatching works it way into the apple, and within a few weeks emerges and lowers itself down to the ground by a silken thread and immediately seeks shelter by crawling up the tree and getting into any crack or underneath any old loose bark, either on the tree, on props, or any loose rubbish which will provide a hiding place. The orchard should therefore be kept free of such rubbish and all trees bandaged at a height of about 10 inches from the ground. The grubs will harbour in the bandages, which should therefore be removed every ten days and all grubs killed. Pick up and destroy all fallen fruit.

Inspectors have now been appointed in different parts of the country, with instructions to see that all growers are using every reasonable precaution to keep the Codling moth and Fruit-fly in check; but we hope that every grower is by this time convinced that it is to his own interest to co-operate with his neighbours in using every means to stamp out these pests, and I feel sure that if every grower will work with a good will that this industry will soon be in a much better position than it has been in the past.

Both Victoria and South Australia have been pleased to pass drastic regulations as to the admission of our fruit into their States, but it is a poor rule that will not work both ways, and our growers are already agitating for retaliation unless we are shown a little more consideration by those States.

If it is desired to spray citrus trees with Bordeaux mixture for any of the different fungus diseases which attack them occasionally, it would be well wherever the trees require fumigation to treat the trees for the scale pests first (if fumigation is to be practised), after which they may be sprayed as many times as is necessary without fear of damaging them—that is, provided they are in a good healthy condition.

Winter Spray for Scales on Deciduous Trees.—At our Wagga orchard we have used the following solution with excellent results in fighting the scales which attack deciduous trees. It also acts as a fungicide, and is applied in August just when the fruit buds are swelling. It is very easy on the hands. Take 12 lb. of sulphur and 6 lb. of lime (properly slaked) and boil in 100 gallons of water for three hours.

Practical Vegetable and Flower Growing.

W. S. CAMPBELL.

DIRECTIONS FOR THE MONTH OF NOVEMBER.

Vegetables.

UP to time of writing, the weather has been singularly dry over a very considerable portion of New South Wales, and there seems to be every possibility of this dry weather continuing through the month of November, unless perhaps thunderstorms occur.

It will be difficult to grow vegetables successfully under these conditions, unless means for irrigating are available; but the use of abundance of dung, both for working into the soil and for mulching, with the assistance of the water that can be spared, may enable anyone really earnest in the matter to raise something for his table in the way of vegetables. The value of trenching or deep digging will be discovered by those who adopt a proper system of treating the soil.

With dry prospects ahead, it would be as well to limit sowing and planting until a change of weather takes place.

Bean, French or Kidney.—This should be at its best, except where late frosts have cut down the plants. Seed may be sown from time to time during the month in almost any parts of the State where the rainfall has been satisfactory. This bean delights in warm, moist conditions. Gather the bean pods whilst they are young and not fully developed, and then it will be found that the flavour and quality is infinitely superior to pods gathered when nearly matured.

When sowing, make drills about 2 feet apart for dwarf or about 4 feet for tall-growing varieties, and sow the beans about 4 inches apart in the drills. Cover to about 3 inches with soil.

Beet, Red.—A little seed should be sown occasionally during the month, in order to keep up a supply for as long a time in the summer as practicable, for it is one of the most useful vegetables for summer use, and one that can generally be relied upon if it be treated fairly well. Instead of sowing in drills in the garden, plants can be raised in a seed-bed, and when large enough to stand a shift can be planted out in the garden whenever space can be found for them. It is quite possible to grow good beets in almost any vacant space, if the space is even only sufficiently large for two or three plants; or a single plant may be put in here and there. Such planting, although a makeshift method, will under some circumstances prove effective, and this and other vegetables may sometimes be had where if planted under ordinary conditions they might fail.

Beet, Silver.—This is another very useful summer vegetable; and if only two or three plants can be grown during the dry weather they might provide a good occasional dish. Seed may be sown in seed-bed, if plants are required. Plant seedlings in rows about 20 inches or so apart.

Broccoli.—In the coolest and elevated districts a few seeds may be sown occasionally in seed-bed, and well advanced seedlings may be planted as required from the bed in which they had been planted to develop. Water before moving the plants, and water thoroughly after planting.

Cabbage.—A good and well-known cabbage for the summer is the variety known as St. John's Day. Another one that may do well in moist districts during the summer is Succession. For the cabbage use a heavy dressing of rotted dung, and during growth stir up the surface soil with hand or wheel hoe.

Prick out a few strong seedlings, and plant advanced pricked-out plants to meet requirements. The cabbage needs a good deal of moisture, and unless this be supplied in dry weather the cabbage is unlikely to succeed.

Carrot.—A little seed should be sown from time to time during the month, in drills from 12 to 18 inches apart.

Cauliflower.—A little seed may be sown, but only in cool districts where the season is satisfactory. The seed-bed should be well looked after, and never allowed to become quite dry. Light shading is advisable, and it should be removed as soon as the plants have come into the second leaf.

Celery.—Earth up, or blanch by any other method that may be convenient, well grown or full grown celery plants. Plant out a few advanced seedlings, and apply abundance of water, if available, and some liquid manure occasionally. This is a semi-aquatic plant, and needs abundance of moisture.

Cucumber, Melons, Marrows, Pumpkin, &c.—These plants are unlikely to make progress during the dry spell, but as soon as rain falls they will grow rapidly, and make up for lost time. In favoured places seeds may be sown as extensively as may be required.

Mustard and Cress.—Even in dry places where but little water is available, these salad plants might be raised sufficiently well to provide an occasional dish, which will be very welcome when green vegetables are practically unprocurable. Sow a little seed from time to time. Use abundance of well-rotted manure, and take means to make the bed somewhat below the surface of the surrounding ground. As a rule, vegetable and flower beds are raised so high up that plants growing in them are far more liable to suffer from dry weather than low beds, and it is infinitely more difficult to apply water to the former than to the latter.

Capsicum or Chili.—If seedlings have been raised, they should be planted out as soon as favourable conditions for planting occur.

Kohl Rabi.—Sow a little seed, transplant when the young plants are large enough, and treat as advised for cabbage.

Leek.—Sow seed occasionally during the month in seed-bed, just sufficient to keep up a supply of seedlings for planting out. Plant out advanced seedlings in shallow trenches. Use abundance of manure, and water the leeks well during their growth. Plants that are nearly full grown should have their stems blanched some little time before use.

Lettuce.—This is a difficult plant to grow in dry, hot weather, for it needs abundance of moisture. Sow seeds where the plants are to grow, and do not sow in seed-bed or transplant, or the lettuces will most probably run to seed.

Onion.—Sow a little seed whenever the soil is in a good moist condition. Attend to onions now in growth; cultivate well between the plants, keeping down weeds.

Parsnip.—A little seed may be sown from time to time to keep up a supply of roots.

Peas.—In cool moist districts only, sow a few rows.

Potato.—Plant out a few rows in heavily-manured land. Use, preferably, whole medium-sized potatoes for seed, free from scab and other defects.

Radish.—Sow a little seed from time to time.

Rhubarb.—This is a good time to sow seed if plants are required.

Tomato.—Plant out from seed-bed as many seedlings as may be required, and train the plants as they grow, providing supports at time of planting.

Turnip.—Sow a little seed.

Flowers.

Many flowering plants should be in perfection during the month, but the dry weather that prevailed during October interfered considerably with their growth. Should rain fall early in the month and good showers occur occasionally, the plants, or many of them, will yet prove satisfactory, and provide flowers in abundance. Remove all flowers from roses as the seed-vessels appear, and prune back the wood slightly to a good strong wood-bud. Those flowers badly affected by thrip should be removed and burnt, to destroy these destructive pests, which cause great damage to the flowers.

Dahlias and chrysanthemums, which should be progressing well, may need water. This should be applied in good quantity at a time, and means be taken that the water soak well into the roots.

Tender annuals may be planted if the weather be favourable, but shade them, and water them well after planting.

Farm Notes.

Glen Innes District—November.

R. H. GENNYS.

Maize.—Early maturing varieties, such as Iowa Silvermine, Pride of the North, King Philip (ninety-day), and Cinquatina (chicken maize), may still be planted. Sow only the best seed from specially selected cobs, if possible chosen in the field. Maize for ensilage may be sown this month, Hickory King and Early Leaming being two good varieties.

Sorghums.—Amber Cane and Planters' Friend may be sown for cutting for cattle or for ensilage; both are much relished by stock.

Millets of all kinds may be sown. Hungarian and New Siberian are good hay varieties. Pearl millet stools well, and produces an abundance of green feed. White Italian is the best for broom-making.

Pumpkins, Cowpeas, Beans, and Squashes may be sown still; but it is getting late.

Cultivate all spring crops above ground to prevent growth of weeds and check evaporation.

Orchards also should be kept well worked with the scarifier or hoe to conserve moisture and destroy rubbish.

Northern Rivers District—November.

A. H. HAYWOOD,
Acting Manager, Wollongbar Experimental Farm.

The extremely dry spell continues. Only 63 points of rain fell since 1st September, and all crops and pastures are at a standstill.

The early-planted crops of maize and sorghum have fared the worst, as often happens in this district, and some will have to be replanted. On this farm the frequent shallow cultivation has had a marked effect on the early crops that have survived, especially maize, potatoes, pumpkins, melons, &c. The vegetation on the trenched plots, which also had received an application of vegetable matter, shows a striking contrast to other plots not so treated.

The dry conditions have, however, favoured haymaking operations.

The varieties of oats, Algerian and Rust-proof, have again proved the only ones to resist rust and give satisfactory yields, all other varieties being failures.

Maize.—Early-maturing varieties of maize may now follow the oat crop, and will have a clean seed-bed and a supply of vegetable matter (in the stubble ploughed in) to assist its growth.

Maize-growing here for grain for market is never likely to be very remunerative; but may be grown with great advantage for fodder and silage, and when conserved in the latter form will supply the three months' deficiency which the universal pasture (paspalum) fails to do.

Where "smut" is prevalent, treat the seed maize with a solution of bluestone (1 lb. to 10 gallons water) to kill the spores, and plant on sections of the farm which has not previously grown maize.

Sorghum.—Will prove a very good substitute for maize for silage. It withstands dry spells better than maize, and will give better results on the poorer class of soils than maize. It is relished by all classes of stock as a fodder. For this purpose it is best sown broadcast, at the rate of 18 to 20 lb. per acre. Amber Cane and Planters' Friend are the best varieties.

Sweet Potatoes.—The dry weather has prevented the planting of vine cuttings; tubers may now be planted. The young plants from tubers will have a better chance than vine cuttings in the absence of showers. Otherwise the vines or root cuttings give better results.

In feeding trials here for condition, when fed to stud bulls and swine, no other class of food has given as quick or satisfactory results as the sweet potato, which, of course, is better used in conjunction with other foods. The White Maltese is the best for feeding purposes.

Pumpkins, Grammas, and Melons.—Should be planted at distances of 8 feet each way, to facilitate the cleaning of crop by means of Planet Junior horse-hoe. The "hills" should have a few shovelfuls of well-rotted manure dug in. Sow six to eight seeds to each hill, to allow for the loss of some plants by the attacks of insects, which may be minimised to some extent by the application of unslaked lime or ashes.

Sugar-cane.—Cuttings may now be planted. The ratoon plants should be cultivated between the rows, and kept free from weeds. Any rough, stony portion of the farm, unsuited to other crops, can be utilised for cane. Choose slender, soft-skinned varieties for fodder. Sets should never be taken from canes that have "arrowed."

Pine-apple.—Suckers may be planted out. Queen, Ripley Queen, and Smooth-leaf Cayenne are the varieties that do best here. Allow sufficient room between rows for horse cultivation.

Bananas.—Plant out suckers. Bananas will only thrive in a sheltered position.

Broom Millet.—May be planted this month. White Italian is one of the best varieties.

Cotton.—An acre plot was sown on this farm last month for trial, the varieties being Early Carolina, Sea Island, and Extra Long Staple. The ground was subsoiled, and soil brought to a very fine tilth, and the seed sown four to the hill, 3 inches deep, in drills 4 feet apart.

Fibre Plants.—Apart from the commercial side, some of these are very ornamental, such as the *Fourcroya gigantea* and Sisal Plant (*Agave sisalana*). These give striking contrasts in well-appointed gardens, on borders of drives, rockeries, &c.; and the fibre can be useful for ties. The New Zealand flax (*Phormium tenax*), however, is preferable for this purpose.

The *Sisalana* and *Fourcroya* can now be planted from suckers or bulbils, and neither are particular as to quality of soil.

Coffee.—Young trees may be planted out in well-drained positions. Shelter-belts are very necessary round coffee plantations. Tap roots should be pinched off before planting.

Grape Vines.—Sulphur to check mildew; tie vines and pinch back, and keep the cultivator going to conserve soil moisture.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Sub-Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1907.

Society.	Secretary.	Date.
Lismore A. and I. Society	T. M. Hewitt	Nov. 13, 14, 15

1908.

Dapto, Unanderra, A. and H. Society	Geo. Lindsay	Jan. 8, 9
Albion Park A., H., and I. Society	H. G. Frazer	,, 15, 16
Berry Agricultural Association	A. J. Colley	,, 21, 22, 23
Central Cumberland A. and H. Association (Castle Hill)	H. A. Best	,, 22, 23
Kiama Agricultural Association	J. Somerville	,, 25, 27
Coramba P., A., and H. Society	H. Hindmarsh	Feb. 5, 6
Wollongong A., H., and I. Association	J. Beatson	,, 6, 7, 8
Alstonville A. Society	Wm. W. Monaghan	,, 12, 13
Moruya A. and P. Society	John Jeffery	,, 12, 13
Gunning P., A., and I. Society	W. T. Plumb	,, 13, 14
Camden A., H., and I. Society	A. Thompson	,, 19, 20, 21
Kangaroo Valley A. and H. Association	E. G. Wilkinson	,, 20, 21
Southern New England, Uralla	W. C. McCrossin	,, 25, 26
Campbelltown A., H., and I. Society	A. R. Payten	,, 26, 27
Ulladulla A. and H. Association	C. A. Buchan	,, 26, 27
Robertson A. and H. Association	A. G. Ferguson	,, 27, 28
Manning River A. and H. Association, Taree	S Whitehead	,, 27, 28
Newcastle A., H., and I. Association	C. W. Donnelly	,, 27, 28, 29
Bega A., P., and H. Society	W. A. Zuegel	Mar. 4, 5
Braidwood P., A., and H. Association	L. Chapman	,, 4, 5
Yass P. and A. Association	Will. Thomson	,, 4, 5
Tenterfield P., A., and Mining Society	F. W. Hoskin	,, 4, 5, 6
Berrima A., H., and I. Society, Moss Vale	J. Cullen	,, 5, 6, 7
Bombala Exhibition Society	W. G. Tweedie	,, 10, 11
Bangalow A. and I. Society	W. H. Reading	,, 10, 11, 12
Glen Innes and Central New England P. and A. Association	Geo. A. Priest	,, 10, 11, 12
Nambucca A., H., and I. Association, Bowraville	Clifford Moseley	,, 12, 13
Blayney A. and P. Association	H. R. Woolley	,, 17, 18
Cobargo A., P., and H. Society	T. Kennelly	,, 18, 19
Macleay A., H., and I. Association, Kempsey	E. Weeks	,, 18, 19, 20
Crookwell A., P., and H. Society	C. T. Clifton	,, 19, 20
Gundagai P. and A. Society	A. Elworthy	,, 24, 25
Inverell P. and A. Association	J. McIlveen	,, 24, 25, 26
Hunter River A. and H. Association (West Maitland)	C. J. H. King	,, 24, 25, 26, 27
Durham A. and H. Association (Dungog)	C. E. Grant	Apl. 1, 2
Warialda P. and A. Association	W. B. Geddes	,, 1, 2, 3
Bathurst A., H., and P.	W. G. Thompson	,, 1, 2, 3
Walcha P. and A. Association	S. Hargraves	,, 2, 3
Moree P. and A. Society	D. E. Kirby	,, 7, 8, 9
Cooma P. and A. Association	C. J. Walmsley	,, 8, 9
Upper Hunter P. and A. Association (Muswellbrook)	Pierce Healy	,, 8, 9, 10
Deniliquin P. and A. Society	L. Harrison	July 18, 19
Murrumbidgee P. and A. Association	A. F. D. White	Aug. 25, 26, 27
Young P. and A. Association	G. S. Whiteman	,, 8, 9, 10

[1 Plate.]

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Agricultural Gazette of New South Wales.

Forestry.

Some Practical Notes on Forestry suitable for New South Wales.

[Continued from page 851.]

J. H. MAIDEN,
Government Botanist and Director of the Botanic Gardens, Sydney.

XVII—*continued.*

Conifers.

VII.

Tribe—Araucarineæ.

These plants mostly do well in the Sydney and warmer coastal districts, and some of them (*e.g. A. Bidwilli*) are displaying considerable powers of accommodation to colder districts.

11. Cunninghamia, R.Br.

A monotypic genus, of geological antiquity. "Remains of cones and foliage closely resembling those of the living species have been found in the lower Tertiary strata." (Veitch's Manual.)

(1.) *C. sinensis,* R.Br.

See Hook., *Bot Mag.* t. 2743; also Sieb. and Zucc., *Flora Japonica* ii, tt. 103, 104.

A handsome, medium-sized tree from South China. In Britain "the foliage of more than one year's standing is invariably more or less discoloured, probably from a combination of causes, which has proved a drawback to its use as an ornamental tree in this country." (Veitch's Manual, p. 292.)

The same conditions apply here in the limited experience we have of it. It also loses much of its foliage at certain seasons. At the same time, as a young tree, it is a very beautiful object, and should certainly be tried by any lover of Conifers in the coastal districts and coastal ranges. Like many other Conifers we want experimental planting in as many districts of New South Wales as possible, and I am certain we are in for many pleasant surprises.

M 25* (Sydney Botanic Gardens).

* These numbers refer to the "Guide (with plan) to the Sydney Botanic Gardens," 8vo., pp. 108; price 6d., postage 2d. extra.

12. Agathis, Salisbury (Syn. *Dammara*, Lambert).

(1.) *A. australis*, Salisb. (*Dammara australis*, Lambert.) "Kauri Pine."

Peculiar to the North Island of New Zealand. The well-known timber-tree, yielding also a valuable recent and fossil resin called Kauri Gum. See Kirk's "Forest Flora of New Zealand." It does not do well in such soil and conditions as we are able to give it in the Botanic Gardens. I do not know an old tree in the Sydney district.

(2.) *A. robusta*, Mast. (*Dammara robusta*, C. Moore). "Queensland Kauri" or "Dundathu Pine."

A very tall tree in dense forest country, chiefly near Wide Bay, Queensland; a broad-foliaged species. It grows fastest and the tallest of all species of *Agathis* in eastern New South Wales.

U 2 K, M 17, L 19 (Sydney Botanic Gardens).

(3.) *A. Palmerstoni*, F.v.M. "Cairns Kauri Pine."

A tall tree from Northern Queensland, considered to be nearest to *A. Moorei.* The leaves are much smaller than those of *A. robusta.*

It is worth trying in good soil in the North Coast districts. It is not in the Sydney Botanic Gardens at present.

(4.) *A. Moorei*, Mast. (*Dammara Moorei*, Lindl.). See *Journ. Hort. Soc*, 1851.

New Caledonia. In the Sydney district it forms a compact growth, and is the handsomest of the species with us.

M 17 (Sydney Botanic Gardens).

(5.) *A. ovata*, n. sp.* (*Dammara ovata*, C Moore), ex Gordon, *Pinetum Suppl.* 28. (See also Gordon's *Pinetum*, 1880 edition, p. 112.)

New Caledonia. A tree of medium size, allied to *A Moorei*, but smaller than that species, and of slower growth in the Sydney district.

M 17, 28 (Sydney Botanic Gardens).

(6.) *A. obtusa*, Mast. (*Dammara obtusa*, Lindl.).

A broad-foliaged species after the *robusta* type, from the New Hebrides. Only does fairly well in the Sydney district so far.

There is no doubt that it would do far better given good soil, shelter, and room to spread and make a tree. This remark applies to most of the species of *Agathis* in the Sydney Botanic Gardens, which are crowded with other plants.

M 17, L 25 b (Sydney Botanic Gardens).

(7.) *A. vitiensis*, Mast. (*Dammara vitiensis*, Seem.). Mueller says it is probably identical with *D. longifolia*, Lindl. The "Dakua" of Fiji.

A noble Kauri Pine, figured in Seemann's *Fl. Vitiensis.* It yields resin, as well as a useful timber.

Does very well in the Sydney district, and fruits abundantly, though it does not produce fertile seeds. It is, of course, from a tropical country, and does not attain full development here.

M 17 (Sydney Botanic Gardens).

* This species-name does not appear to have been previously employed by botanists.

Agathis Moorei, Mast. Botanic Gardens, Sydney.

N.B.—There is a *Prumnopitys* at the back, giving the Agathis a more dense foliaged appearance than it really has.

Araucaria excelsa, R.Br.

The so-called "Wishing Tree" in the centre of the Middle Garden, Sydney Botanic Gardens.

(8.) *A. loranthifolia*, Salisb. (*Dammara orientalis*, Lamb.) "Amboyna Pine." See *Bot. Mag.* t. 5359.

Native of the Moluccas. Yields the well-known resin called "Dammar."

Tender in the Sydney district, and doing fairly well with us. It certainly should be tried in north-eastern New South Wales.

M 17 (Sydney Botanic Gardens).

13. Araucaria, Jussieu.

Confined to temperate South America, Eastern Australia, and the Pacific Islands. A most desirable group of plants for coastal New South Wales.

(1.) *A. Bidwilli*, Hook. The "Bunya Bunya."

Native of South Queensland. A large tree which does well in the coast districts in good, deep soil, with shelter. It is creeping inland. It is a very handsome and desirable tree for the middle of a plantation. The large seeds were formerly used as food by the aborigines.

L 7, 15, 35 (Sydney Botanic Gardens).

(2.) *A Cunninghamii*, Ait. "Moreton Bay or Richmond River Pine."

Our one New South Wales *Araucaria*, and, in my view, a beautiful species. Like most species of this genus, its branches are verticillate, and it carries the greater number of its leaves towards the ends of them, which gives to it a somewhat unusual tufted appearance. The bark, which is somewhat thin in young specimens, and deciduous, leaves the tree, not in longitudinal, but in vertical strips. The natural habit of this tree can be altered to some extent by a judicious use of the pruner, in cutting back the ends of the longest branches, and so inducing a back growth, which has the effect of a compacter habit. Great care requires to be exercised in the operation.

This tree yields a large proportion of the White Pine timber used in this State It is, however, inferior to the best American and Baltic timbers.

M. 25, L 8 (Sydney Botanic Gardens).

Var. *glauca* (*A. glauca*, Antoine). See *Gard. Chron.*, 1888, 685, fig. 90.

The botanical position of this tree demands further inquiry, and its difference, if any, from the New Guinea *A. Beccari*, Warburg, requires thorough investigation.

Wide Bay district of Queensland and coastal Queensland generally.

It does not make a very handsome tree in Sydney, being much stiffer growing than the normal species, but it is well worthy of extended trial in the warmer coast districts.

L 23 g (Sydney Botanic Gardens).

(3.) *A. excelsa*, R.Br. "Norfolk Island Pine."

Native of Norfolk Island, as its name denotes.

Largely used in New South Wales for planting in the vicinity of the sea for shelter and other purposes. A very hardy tree in the coastal districts, and often planted as a specimen tree. It does well in the Sydney district, and is, indeed, the most popular member of the genus for general planting in coastal New South Wales.

U 3, 8; M 13, 18; L 1, 8, 13, 18, 22, 29 (Sydney Botanic Gardens).

Araucaria Cookii, R.Br.
Federal Government House, Sydney.

Araucaria Rulei, F.v.M.
Garden Palace Grounds, Sydney.

(4.) *A. Cookii*, R.Br. "Captain Cook's Pine."

Figured as *A. columnaris*, Hook. in *Bot. Mag.* t. 4635. See also *Nouv. Archiv. du Muséum*, t. vii, pl. 14.

The foliage is very similar to that of the Norfolk Island Pine, but its habit is very different.

Native of New Caledonia and the New Hebrides. A handsome species which does well in the Sydney Botanic Gardens, *e.g.*, M 7, 17, 19; L 7. There are some fine specimens at Bondi, Ryde, and other places.

Certain horticultural varieties are recognised, *e.g.*, vars. *pendula*, *Raoulei*, *rigida*.

(5.) *A. Rulei*, F.v.M. "Rule's Pine." See Lindley in *Gard. Chron.*, 1861, p. 861, with figures (the original drawings of the species); also *Nouv. Arch du Muséum*, t. vii, p. 16.

Native of New Caledonia.

Resembles the Chili Pine (*A. imbricata*) a good deal in external appearance. It is worthy of further experiment, especially along the North Coast, for it was reported by its discoverer in language indicating its superlative beauty. It will not stand exposure.

U 8 d (Sydney Botanic Gardens).

(6.) *A. Balansæ*, Brongn. and Gris. The "Balansa Pine." New Caledonia. See *Nouv. Archiv du Muséum* (Paris), t. vii, pl. 13; also *Ill. Hort.*, 1875, t. 204; 1894, t. 197, for figures.

Sydney is rather cold for it, and it apparently wants better soil for its full development than we are able to give it in the Botanic Gardens. One of our trees is about 20 feet high.

The late Mr. Charles Moore distributed this Pine under the unpublished name of *A. elegans*, which I have ascertained from specimens here.

M 21, 25; L 1 (Sydney Botanic Gardens.)

(7.) *A. montana*, Brongn. and Gris. *Nouv. Archiv. du Muséum*, t. vii, pl. 14.

New Caledonia. Not in Sydney at the present time.

(8.) *A. Muelleri*, Brongn. and Gris. *Nouv. Arch. du Muséum*, t. vii, pl. 15, 16. Also *Ill. Hort.*, vol. 29, pl. 449.

A handsome, coarse-foliaged species. Not in Sydney at the present time.

(9.) *A. imbricata*, Pavon. "Chili Pine" or "Monkey Puzzle."

A tall tree attaining a height of 100 feet under favourable circumstances, native of South Chili, and well known for its dark, handsome, rigid, lance-like foliage.

It grows, but does not flourish, in the Sydney district; it does well in many of the cooler parts of the State.

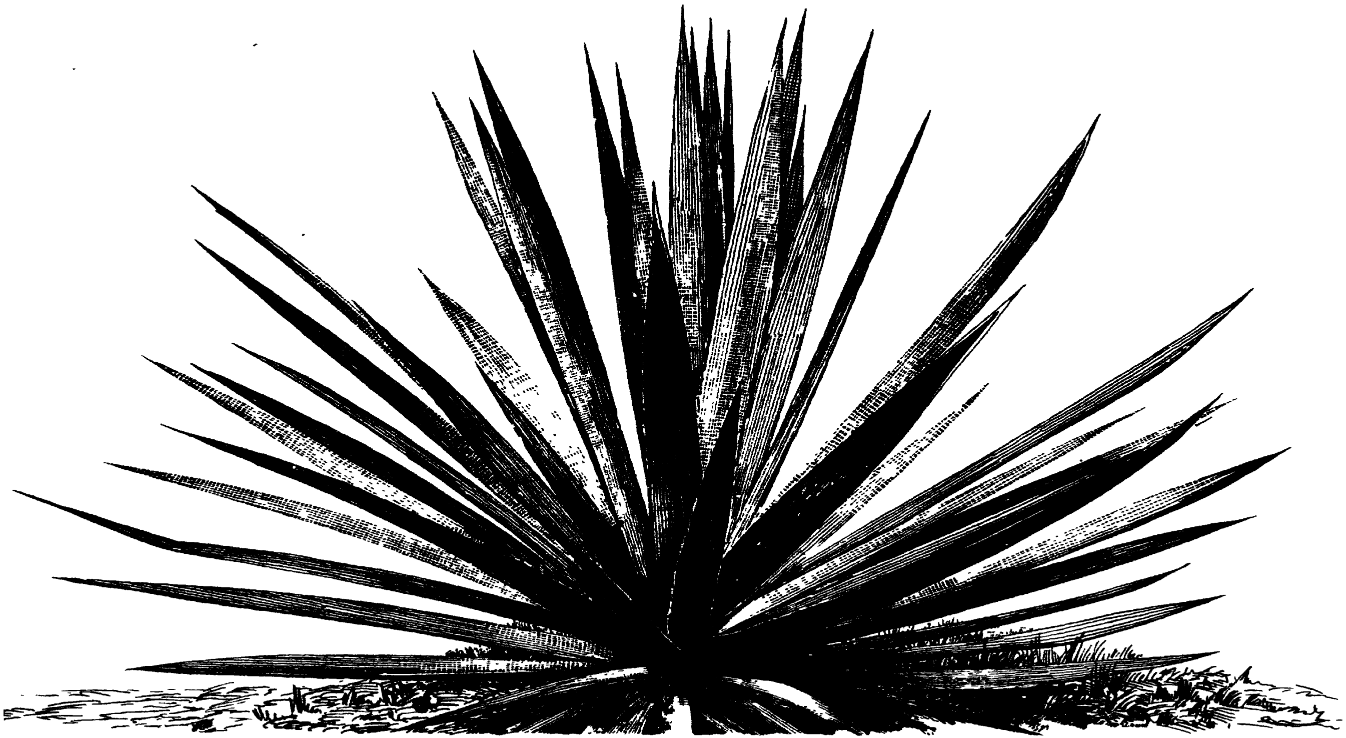
(10.) *A. brasiliensis*, A. Richard.

A tree of 70–80 feet, native of the mountains of Southern Brazil.

Much cultivated along the Mediterranean littoral of France and Italy, but it does not appear to be in Sydney at the present time.

Of the coarse-foliaged species it does better in Sydney than *A. imbricata*, and not so well as *A. Bidwilli*.

(To be continued.)



SISAL HEMP PLANT.

AGAVE RIGIDA, MILLER VAR SISALANA.

Sisal Hemp (*Agave sisalana*).

Report from Mr. A. H. HAYWOOD,
Acting Manager, Wollongbar Experimental Farm.

THE plants under observation were planted in the year 1899, in rows of 10 ft. x 10 ft. During the early stages of the growth, up to two years, the plants were cultivated between the rows; after that all growth was kept in check by cutting and brushing. The first harvest of leaves was cut when the plants were two years old, and since then four cuttings have been made.

Fig. 1.—Harvesting Sisal.

Most of the plants have now reached the poling stage—that is, from the heart of the plant a pole or flowering panicle has sprung up. This poling completes the life history of the plant; but if the pole is cut just above the base of the upper leaves when it reaches the height of 4 feet, the fibre-producing power of the plant is prolonged for another year. These poles are now 21 feet in height—some 25 feet—and 4 to 5 inches in diameter at the base.

The branches, which form at right angles to the stem, carry many orange-tinted flowers. These flowers fall off, and at the ends of the branches in the axils near the flower scar there are produced numerous small bulbils, which eventually develop into plantlets. From the one poling plant sometimes as many as 2,000 to 3,000 bulbils are produced. These may be used for starting new plantations. The most favoured method of propagation, however, is by means of suckers which are thrown out from rhizomes of the old plants.

Fig. 2.—Showing the Experimental Plots after removal of the leaves.

The first crop of leaves of the plants may be cut at the end of two years when grown from suckers, or three years when grown from pole plants or bulbils. It is claimed also that pole plants are not capable of producing such robust plants or such long livers; but this point has not as yet been clearly demonstrated.

Description of Typical Plant.

The height of plant, 6 ft. 10 in.; trunk short, and about 10 to 12 inches in diameter; leaves of a dark-green colour, varying from 3 ft. to 3 ft. 10 in.

in length, and 4 inches wide at middle; each leaf is armed at the end with a sharp spine point tipped with black.

On 12th August, 1907, ninety leaves were harvested from the plant shown in Fig. 1, nine leaves being left uncut on the plant—the usual number. The weight of the ninety leaves was 144 lb.; an average leaf weighed 1½ lb.

Method of Planting and Preparation of the Ground.

On the experimental plots here the ground was ploughed and thoroughly tilled before planting, and where it is practicable this is advisable. But

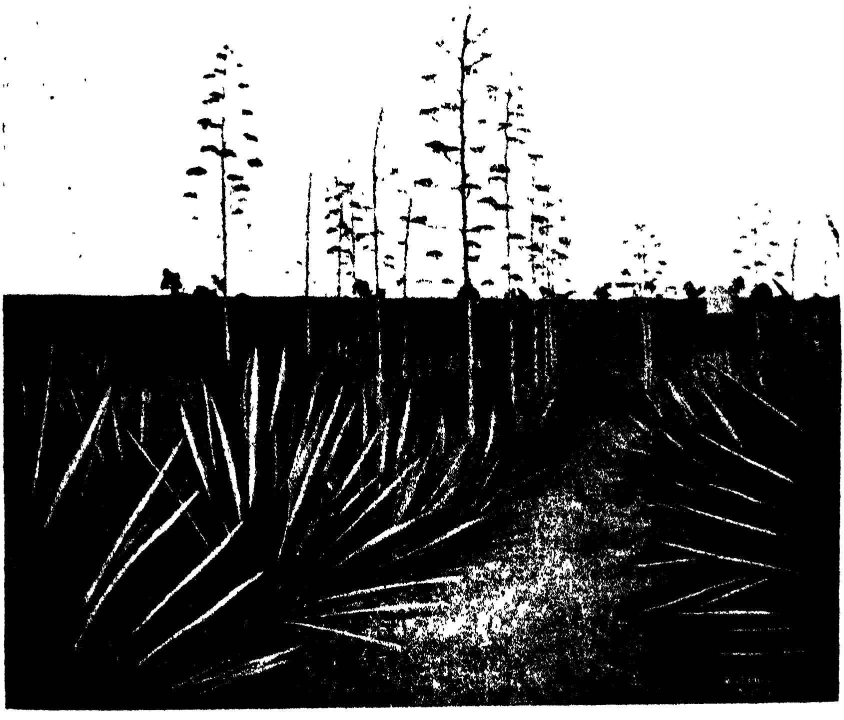


Fig. 3. Poling Sisal Plants. Flowering stage.

where the selection of site for plantation has been made in rough country and poor average soil, where ploughing is impossible, the land should be cleared of all brush and weeds, and stakes marking the lines for the plants driven in 8 feet apart. Then holes 10 inches in diameter and 12 to 15 inches deep should be made at distances of 7 feet along the lines for the reception of the plants. At these distances it will require about 800 plants per acre.

The young plants are lifted from the nursery when they are about 18 inches long, and a few of the lower leaves removed and then firmly planted in the holes.

Care should be taken that no soil fall between the leaves, as this retards the growth of the plants. Planting may be done at any time of the year, but preferably in the rainy season.

Information on Sisal Hemp has appeared in the *Agricultural Gazette* as follows:—Vol. II, page 176 (note); Vol. III, page 749 (article by F. Turner, with plate); Vol. III, page 1036 (note); Vol. IV, page 142 (note); Vol. XII, page 1019 (note); Vol. XIII, page 223 (translation from *Journal D'Agriculture*); Vol. XIV, page 949 (note); Vol. XV, page 530 (note); Vol. XV, page 949 (article by C. H. Gorman).

Fibre Preparation.

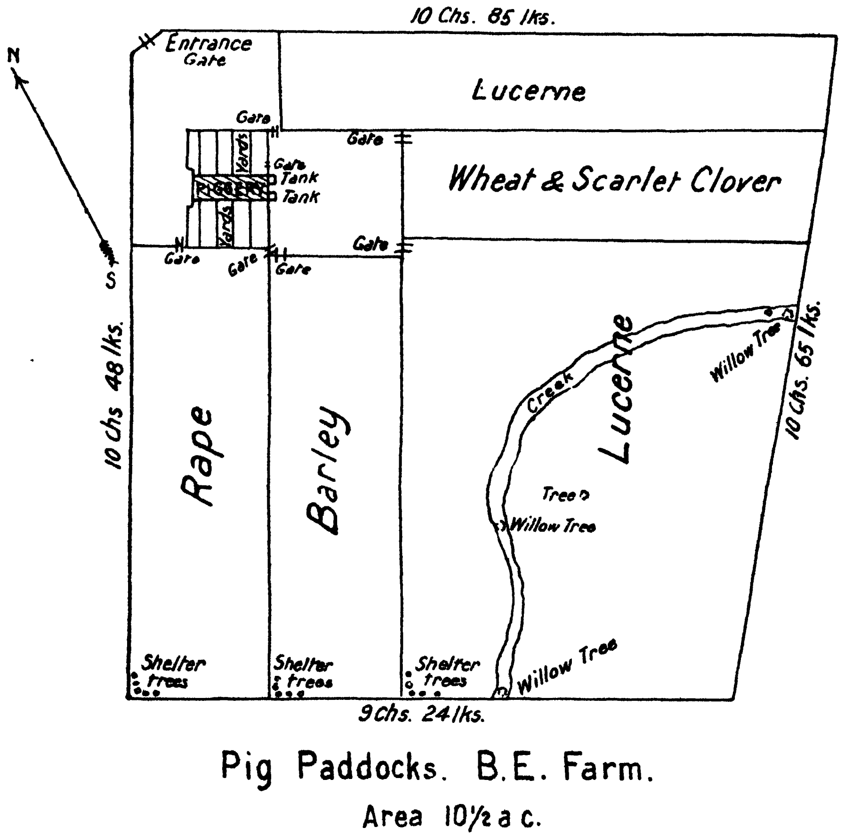
(By Havelock.)

Having received a very cordial invitation to visit the Experimental Farm at Wollongbar, as they were scutching fibre, this scribe took the opportunity, on the last half-holiday, of driving there. On arrival, I was received by the ever-courteous acting-manager, Mr. Haywood, and his assistants, and the hum of the distant machine gave directions as to the place to be visited. A certain amount of interest very naturally attached to the fact of it being my first view of the work; but it was a little disappointing on account of the fact that the management of the farm have no proper sisal machine for their use, but have to use a "Faure" decorticating machine, which was intended for Ramie fibre, and certainly, by the widest stretch of imagination, could never be expected to give the best results as far as sisal and kindred fibres are concerned. One would need to see a "Barraclough" sisal machine, or one of a kindred pattern, to understand what is the great difference between sisal and ramie. However, the operator and his assistants were turning out a beautiful sample of fibre, clean, and that which was dried was beautifully clear staple, and such as would rejoice the heart of a sisal grower. The operator also put through a few stalks of Manilla hemp (*Musa textilis*), and several leaves of the Fourcroya gigantea to show the different samples that could be produced, and last, but not least, a bunch of Ramie or Rhea, all of which I have sent to your office, Mr. Editor, so that anyone who may be interested in fibres can see for themselves what can be produced in the district. The whole forms a most interesting object lesson, *i.e.*, that if "our lady, the cow," should fail us in any way, we have other industries which can be utilised to supplement, may be a failing cream cheque. Although I do not for an instant say that land at £20 an acre should be planted with fibre, still there are on a large number of farms in this district a great deal of land which, from its rugged nature, is unavailable for pasture, and by the exercise of co-operation a mill could be erected which would give the best returns to the growers, and, best of all, there would be a certain income in spite of any weather. In passing, I noticed that an abundant crop was being gathered from the coffee trees, which are loaded with berries, and looked splendid with their beautiful green leaves and bright scarlet berries. Although one could not help thinking that without cheaper labour it would be a tedious and little remunerative work for Europeans—but that is another story, and I must not digress. Given a proper situation, there is no doubt that the coffee is an abundant bearer in this district. Side by side with the coffee were several small shrubs of Assam tea which are worthy of note.—*The Northern Star*.

Pigs on the Paddock System.

R. W. PEACOCK.
Bathurst Experimental Farm.

PIGS are not the favourites they should be in New South Wales. This fact is due in no small measure to the system of farming followed. The necessity of paying more attention to the smaller branches of agriculture has not been forced upon the farmers of this State. With comparatively large areas, other stock, such as sheep and cattle, claim almost sole attention. With closer settlement upon smaller areas, the pig will attain more prominence.

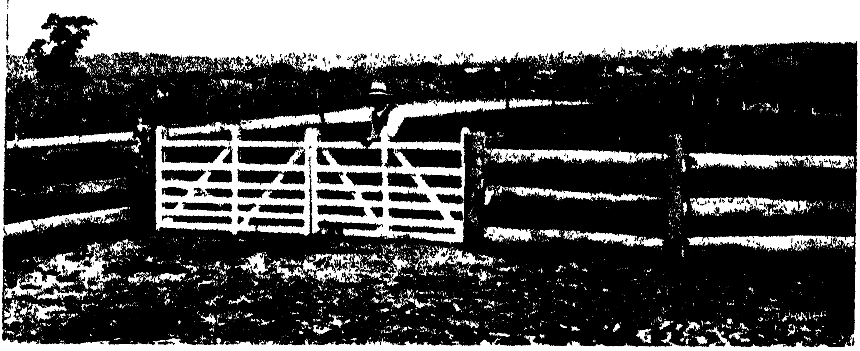


Plan of paddock.

Latterly the high prices of cattle and demand for young dairy stock have seriously checked the pig industry. Several years ago the low prices of cattle did not warrant the rearing of dairy calves, and large numbers were killed, and pigs fed on the milk which formerly was fed to the calves. At the present time, calves have the preference again.

Paddock and divisions.

Generally speaking, the farmers only keep a limited number of pigs, fed in sties upon the waste products of the farm. Under such a system considerable labour is entailed in the hand-feeding and watering of the animals. The paddock system of feeding has not been sufficiently appreciated. Farmers must set themselves the task of producing suitable pigs of 120 lb. to



Three-rail fence and gateway.

150 lb. dressed weight, at 3½d. per lb. Such prices do not allow of expensive methods and unlimited labour in the industry. To be produced at such prices profitably, the pig must be looked upon as a grazing animal, and taught to help himself to pastures and crops grown for his especial benefit. With judicious management he could graze five to seven months of his existence, to be topped off with waste grain from the farm such as barley,

oats, wheat, maize, peas, &c., for the last six or eight weeks. Whilst young and at weaning it may be wise to feed a little crushed grain or pollard to ensure a satisfactory start.

Many fodder crops may be grown if suitable paddocks are provided. Those suitable for the soil and district should be chosen. In order to give an idea of a suitable subdivision for pigs, a plan of the paddocks at this farm is given. Lucerne is grown as the principal standby for summer feeding; rape, barley, and rye for winter fodder; Scarlet clover and wheat for the spring; maize is also used for summer feed. The annual crops are rotated to advantage.

The gateways are sufficiently wide to allow of the passage of the ordinary farm machinery.

Subdivision fence.

Shade is provided in the paddocks. Inexpensive shelters could be provided in the square at the entrance to the paddocks. Under this system, the sloppy, filthy sties, too prevalent upon many farms, would be non-existent.

Pigs upon good pastures are not rooters to any extent. Good pastures make contented pigs. Extraordinary fences are not required for such. Marsupial netting, as shown, is very suitable.

The carrying capacity of a given area would depend upon the quality of the land, rainfall, and also upon the quality of the farmer. Eight to ten pigs per acre should be carried under fair average conditions. Many crops, such as pumpkins, melons, swedes, &c., could be profitably turned into pork.

The question is one well worthy the consideration of farmers.

Hawkesbury Agricultural College and Experimental Farm.

THE HOUSE SPARROW IN NEW SOUTH WALES.

[Continued from page 538.]

C. T. MUSSON.

Sparrow food.

During the nestling stage the food consists largely of soft-bodied insects; but after leaving the nest the amount of animal food gradually decreases during the first four or five weeks of independent existence, until it makes only a small proportion of the average food. Various authorities have placed the adult sparrows animal food at from 2 to 19 per cent. of the total amount consumed. It would seem that the birds food may be placed somewhat as follows, subject to fluctuation as to the different kinds according to local and other circumstances:—

Grain of some kind	75	per cent.
Grass seed	5 to 7	,,
Weed seed	10 to 17	,,
Insects	2 to 6	,,
Other things	Up to 5	,,

Summarising, this comes to about 95 per cent. of vegetable matter, for which it draws largely on man's supplies.

It is calculated that each pair of sparrows will kill (in Europe) 30,000 insects during the breeding season. These would not all be detrimental. Necessarily the amount of good they do will depend upon the class of insects consumed. They will eat ⅓ of an oz. of wheat per day—that is, fifty sparrows would eat 1 lb. of wheat per day, besides wasting, perhaps, as much or more.

They find plenty of food in any farming district, soon finding out where poultry, pig, and other food is scattered, and are ready at the feeding hour for a share. We have seen at the College, on foggy mornings, when the poultry buildings are hardly perceptible in the distance, small parties of sparrows make for the yards in a straight line from their roosting places, just at the time when the early morning feed is being distributed. In the country, to which they soon make their way from the towns, they are found to be always pilfering. That they feed on insects is certain, but not to any great extent. The chief work in this direction is during the nesting season. The year round they feed on grain of some sort; when growing, and whilst young and soft, they seem particularly fond of it, but will often leave it alone when it becomes hard. We have seen them desert sorghum for summer grass seed. Flocking in the late summer, it is then that the largest amount of damage is done.

That the range of vegetable food is very wide, nothing apparently coming amiss to them, is seen on looking over the accompanying list of plants

damaged, as taken from the reports sent in. From personal observation, it can easily be shown that they are truly omnivorous. We have seen them clustering round back premises, eating kitchen scraps; they take bread and the remains of sandwiches (spread on flower beds for other birds) freely; are very fond of suet which is fastened on to a wire fence for other birds. They will take meat scraps, pick at bones, and, as we know, collect a large amount of food from horse droppings in the shape of waste grain.

Sparrows eat weed seeds.

In considering the good and evil deeds of the sparrow, we must not forget to give full credit for the large number of weed seeds destroyed. There are certain periods in the year when fruit and grain are not obtainable, and the bird falls back on the food its ancestors had to content themselves with before cultivation provided the more plentiful and dainty food now placed within their reach. Only two correspondents remark on this habit of eating weed seed; nevertheless it is a very persistent habit, and a large number of seeds must be annually destroyed, although the benefit accruing may not be perceptible. Moreover, some of the grass and weed seeds actually eaten might produce useful plants under certain circumstances. It is, however, in view of the fact that many weed seeds are eaten in addition to insects, hardly correct to say of the sparrow as one correspondent writes—"Utterly impossible for the sparrow to do any good." The real relation of the bird to its surroundings is here quite lost sight of.

Many observations were made confirming the fact that weed seeds form a considerable portion of their food at times. This matter of sparrows eating the seeds of detrimental plants, and, therefore, possibly being an agent in helping to keep weeds down somewhat, probably has no appreciable effect on the number of weeds; but the fact should certainly be credited to the birds.

It may be stated here in relation to possible spread of weeds by sparrows, that the matter has been definitely settled by investigation.

In general, seeds cannot pass through the sparrows' body and retain their germinating power. Such seeds as they eat are small and with coats usually readily removable, the kernel being in most cases digested. A few hard seeds may, however, occasionally pass through the body without losing the germinating power—as, for example, the small black seed of amaranth.

The writer is convinced that much of the trouble attributed to sparrows is wrongly referred to them, particularly in relation to the damage done to vegetables and amongst fruit-trees. Several statements have been made to this effect which have been positively disproved. Sparrows in these cases have been feeding amongst vegetables certainly; but their food consists of insects picked off the plants, or weed seeds taken from the ground.

They have also been reported as being amongst the fruit-trees and doing damage. From careful observation, it was certain that the trees in some cases were only being used as shelter, for on several occasions they were watched and observed to be feeding on weed seeds under and near the trees. These birds are not always to blame for damage done; they are certainly misjudged at times. It is doubtless hard to tell as to what they are actually

doing, without spending time in watching, and examining the stomach and crop of the birds actually seen feeding.

It must never be forgotten that in this country, where the air is dry and water for drinking purposes sometimes scarce, or only to be obtained at some considerable distance from the feeding ground, that seed-eating birds, most of which are water drinkers, take the soft flesh of fruits, grapes especially, probably for the moisture they contain. It has, therefore, been suggested that we should provide drinking places—shallow troughs placed out of reach of cats—to which they may come, and thus minimise the risk attached to the possibility of their coming for fruit to quench their thirst.

The actual ratio of benefit to injury in their food habits cannot be arrived at with exactness; it must be roughly approximated.

Some orchardists welcome the sparrow as decidedly useful; and recently a Californian grower has stated that he plants food trees for them, and encourages them in every possible way, for he says they help him to keep his orchard free from pests.

Their feeding habits vary in detail, in relation to "customary" and "occasional" food. The birds vary their diet to the necessities of their local circumstances, making use of the food presented to them through the months either by Nature or man.

The direct effect of any injury done is easily observable; the damage done is definite and final. The indirect effect of eating any insect is obscured. But a noxious insect destroyed implies not only the preservation of the amount of produce which that individual insect would have eaten, but the absence, in the following season, of the brood of young to which it would have given birth had it been allowed to live.—(THEODORE WOOD, in the "Farmers Friends and Foes.")

Naturally, the sparrow is viewed by the individual grower from a very different standpoint to that taken by mankind in general. The former takes the effect on his pocket as his guide; in general, we view the bird as to whether the good done will counterbalance the evil; hence we may have conflicting opinions—as, where the gardener, who sees his plants cleared of aphis, approves of the sparrow, and sees but little evil in him; whilst his neighbour, the farmer, sees no good.

Results of Examination of Stomach and Crop of 109 Sparrows killed on the College Farm.

One hundred and nine Sparrows were examined at the College between August, 1904, and October, 1905, and the result showed that much food is taken from cereal crops; grapes were attacked in only two cases; a considerable number of birds (47 per cent.) fed on weed seeds, in some cases, to a large extent; 15½ per cent. fed on noxious insects; in only one case were beneficial insects destroyed; 31 per cent. fed on small insects not known to interfere with crops in any way, and, therefore, must be classed as neutral; in eating them Sparrows cannot be considered as doing any good for us; 88 per cent. fed on cereal grain of some kind. These results certainly point to a considerable amount of good being done through the clearing away of weed seeds and the destruction of a quantity of noxious insects, the final balance being, however, against the Sparrow.

List of Plants, &c., stated to be damaged by Sparrows.

Cereals—when sown and when ripening.
Flowers of garden plants.
Fruit trees, all kinds—Fruit, buds and leaves.
Lucerne.
Maize—not commonly.
Millet—all varieties, a favourite food.
Poultry food.
Saltbush—leaves.
Sorghum—when in seed.
Stacks—grain and chaff.
Vegetables—seed and young plants.

As to the injuries inflicted.

They injure many things; feeding on stored grain, fruit, buds, growing cereals, vegetable seeds, seedling plants; wasting a good deal that is not eaten. They accumulate dirt about buildings and contaminate the water supply. They eat useful insects at times. They destroy bees at times. They rob poultry of their food. Break down the crops in getting at the grain. Waste much grain and chaff by attacking stored products. Damage young growing crops at times. The injuries they inflict upon the grower, largely outweigh the good done through destroying insects for food; although it is impossible to calculate certainly the value of the latter work.

As to any benefit they confer.

They are not reported as of marked benefit in any way; but they eat injurious insects at times, more especially so during the periods when they feed the young. They feed on aphides at times. Will not eat insects when grain or fruit is obtainable. They are beneficial in kitchen gardens when not eating the seed. They consume a considerable number of weed seeds.

Dr. Hart Merriman says of the sparrow: "Its only use is to be eaten."

That the sparrow was an article of food in Shakespeare's time may be inferred by his line, "I will buy nine sparrows for a penny," though it must be remembered that the name was used in the old days for any kind of small bird

In parts of France earthenware nesting pots are placed against the side of the cottages for the house sparrow to nest in, so that the young may be easily secured for cooking purposes.

As to any means that have been taken to restrict them.

Shooting and poisoning have been carried out with a moderate degree of success, but only spasmodically, and not in any systematic way.

A few private individuals have interested themselves successfully in raising money locally to pay for labour in killing off a first invasion of the sparrow.

Where they are few in number not much notice is taken of them.

They are hard to poison. Being so wary, they will not take the poisoned grain after the first few have been killed.

A few correspondents have done their best by warning growers as to the serious results likely to follow an increase in their numbers and extension of their area. In nearly all these cases the advice has been ignored and the matter left alone.

We have tried at the College poisoning their drinking water by first dissolving corrosive sublimate and then mixing it with the water in a small tank, which is wire-netted in, and used for measuring evaporation. So far as is known to us, the results were entirely negative.

It is dangerous at all times to poison drinking water; dogs or poultry may get at it. Therefore, the method cannot be recommended.

(*To be continued.*)

Barley and Vetches or Peas as Winter Greenstuff.

A. H. E. McDONALD,
Experimentalist, Hawkesbury Agricultural College.

The question of ensuring a supply of greenstuff for winter use is one which must be faced by the dairy-farmer every year; and as it has a very direct influence on the milk cheque, it is worthy of some consideration. Barley and oats have long enjoyed a reputation for the purpose; but experiments during the last few years have clearly shown that alone they do not give the most satisfactory results. This is due to the fact that all cereals, while being rich in carbohydrates, or fat-forming constituents, are deficient in nitrogenous matter or protein, and consequently do not form an evenly-balanced food. Before an animal can make its best growth or produce the largest amount of milk, a food must be supplied in which the two main constituents, carbohydrates and protein, are present in their proper relative proportions. This has long been recognised, and it has been the custom, when foods containing a high percentage of carbohydrates are fed, to make good the deficiency of protein by purchasing meals and cakes rich in nitrogenous matters. These have given good results, and have always been used at a profit; but their purchase means a cash outlay, and if some crop could be produced on the farm which would successfully take their place, the profits would be so much greater. Such a crop is found in the legumes. They differ from the cereals and grasses in having a relatively large proportion of protein to carbohydrates and fat. The cereals and the legumes then each possess something which the other lacks, and when used together in the proper proportion give a more suitable class of food than either used alone. The mixture can be easily and economically obtained by simply mixing and sowing the seeds of the two kinds at the same time.

So far, it seems that the most valuable legumes for the purpose are Black Tares and Field Peas. These grow readily, and reach the best stage for cutting at about the same time as the cereal. They can be grown alone, and form a very valuable forage crop; but the vines, owing to their tangled nature, are very difficult to harvest. This trouble is avoided when they are grown with barley, as the upright growth of the cereal gives a support to the weaker-growing stems of the legumes. The mixture forms excellent grazing, is valuable for soiling, and makes very good ensilage. The combination is highly palatable, and is much relished by dairy stock.

The seed should be sown at the rate of 20 to 30 lb. of the vetches or peas to a bushel of barley, and sown either by a drill or broadcast, in the usual manner of sowing barley alone. No difficulty is found in running the seed through an ordinary wheat drill. The first sowing should be made as early in the season as possible, and additional sowings made at intervals of three weeks or a month, to give a succession of greenstuff right on into

early summer. Very often ploughing for the winter crops is delayed until rain comes, and much valuable time is lost. The ground should be broken up as early as possible in the season, and reduced to a fine condition by harrowing and rolling. Any light showers which then fall may be taken advantage of to get the seed in the ground. It quickly germinates, and the young plants are ready to receive full benefit from whatever rain falls, and are able to make good growth before the very cold weather sets in. A good start makes all the difference, and the loss of a few days at sowing-time is reflected in the crop right through the season.

The crop is in the most valuable condition for feeding when the barley is coming out in ear. At this time the weight per acre is greatest, and the material is richest in food matters. The cuttings can be made earlier; but it is better to make a succession of sowings, so that the crops can be cut at the right stage, than be compelled to cut before or after the most suitable time. The only increased expenditure in growing this mixture is that required for the vetch seed; but this is far more than balanced by the greatly increased food value of the crop. If more attention was paid to the production of crops to supplement the pastures, and which would tend to keep the milk supply at the normal level, the returns from the dairy herd in the colder months would be much more satisfactory than at present.

Hawkesbury Agricultural College.

MONTHLY WEATHER REPORT.

SUMMARY for October, 1907.

Air Pressure (Barometer).			Shade Temperature.				Air Moisture Saturation = 1·0.			Evaporation (from Water Surface).			
Lowest.	Highest.	Mean.	Lowest.	Highest.	Mean.	Mean for 15 years.	Lowest.	Highest.	Mean.	Most in a Day.	Total for Month.	Monthly Mean for 9 years.	% of the year's Evaporation.
[illegible] 1.	30·38 4	30·03	35·6 4.	96·8 18.	66·03	63·41	35 21.	86 7.	54·9	·440 19.	6·877	4·819	15

Rainfall... { Points .. 39½ 3 11 8 1 1 = 63½ points. Mean rainfall for 15 years. 172 points.
{ Dates ... 6 7 20 27 30 31

Thunderstorms on 26th, 29th, and 30th.

Greatest daily range of temperature = 55·8°, on 18th.

Days on which shade temperature rose above 90° = $\frac{92\cdot4}{1}$ $\frac{93\cdot0}{12}$ $\frac{96\cdot8}{18}$ $\frac{92\cdot0}{20}$ $\frac{92\cdot6}{26}$ $\frac{91\cdot0}{30}$

Wind ...	N	NE	E	SE	S	SW	W	NW
	12	6	6	2	9	12	10	8

Remarks.—Rainfall still well below the average. Compared with last year (our record dry year) the rainfall for ten months ending 31st October is 14·73 inches, as against 14·50 inches for same period of 1906. The mean temperature and total evaporation for the month are remarkably high—the highest recorded for over ten years.

W. MERVYN CARNE,
Observer.

Diseases of Fowls.

[Continued from page 873.]

SCROFULA, TUBERCULOSIS, CONSUMPTION, LIVER DISEASE.

G. BRADSHAW.

IN every poultry yard, of whatever size, scarcely a season passes but some deaths take place among the adult fowls, and in the majority of instances such have been due to the above diseases, all of which are allied by having many symptoms in common, the disease being known to poultry-men by the general term of "going light." Fowls affected usually go about in a listless manner, become thin and emaciated, mope about, and ultimately die. When examined they are found to have scarcely an ounce of flesh on them, and this despite the fact that they had a ravenous appetite until death.

Scrofula, in bygone times, was understood to be an affection of the glands of the neck, but at the present time the ailment is looked upon as a form of tuberculosis.

Dr. Woodroffe Hill, F.R.C.V.S., England, says that in the numerous varied descriptions of poultry that reached him daily for *post mortem* examination, scrofula and tuberculosis or consumption were more frequently present than any other disease, and that although they are one and the same disease, they may exist under different conditions, scrofula being a disease of the system, of which tuberculosis is the local manifestation. The same authority says in-and-in breeding, and the propagation from diseased stock, are the chief causes; and further, that the disease is favoured by every condition which renders the blood unhealthy. Malformations of the chest, defective structure of the lungs, unsuitable nutrition, being all influential in the production of the disease.

Its hereditariness is unquestionable, and therefore it manifests itself most forcibly after in-and-in breeding.

A medical gentleman, a large breeder of poultry, lost the whole of his stock through adopting the latter system, in order to obtain certain points. Tuberculosis is frequently preceded by some previous disease. It may follow roup, and often when cases of roup are cured, consumption, or a wasting away, follows.

In poultry, scrofulous deposits are sometimes found externally, amongst others being enlarged joints. In some cases the scrofula is more pronounced than others, the liver especially inviting the deposit. The organ becomes an enormous size, and is then known as liver disease. In other instances it affects the mesenteric glands, and is then known as consumption of the bowels. Fowls so affected have continuous diarrhœa, and waste away rapidly.

In pulmonary tuberculosis the deposit is found chiefly in the lungs in small nodules of a cheesy nature, and in late stages of the disease the whole structure of the lungs is broken down. The treatment should consist largely in the way of prevention. Sanitary measures are matters of the greatest importance, clean houses, runs, &c. If there be an inclination to doctor some of the cases in the early stages, tonics are best, while cod-liver oil has been used with good results. For a tonic there is nothing better than the arsenate of iron in pill form, 1 grain twice a day. At the same time, the most competent authorities maintain that birds with tuberculosis are seldom cured by any treatment.

The following article on the above subject was contributed to an English poultry paper some time ago:—"The broadest fact established regarding the exciting cause of tuberculosis deposit is that the domesticated animal is more liable to tubercular disease than the same animal in a wild state. The stabled cow, the penned sheep, the caged lion, tiger, or elephant, are almost invariably cut off by tuberculous affections, no doubt due to deficient ventilation, and the abeyance of normal exercise of the pulmonary functions. Compare the ordinary barnyard fowl with the highly-bred show bird as to vigour, stamina, and freedom from hereditary disease, and the former, generally speaking, shows the cleanest bill of health, for this reason: it lives in a more natural condition, is not crammed with artificial food, or dosed with quack nostrums, and gets what grit it chooses to find without being supplied with any special form. The ravages of tuberculosis in the human family are too patent to ignore its gravity in the lower creation, and the poultry fancier will best consult his own interests in studiously avoiding breeding from or purchasing birds of scrofulous or tuberculous taint, and in the event of the disease manifesting itself, to dispose of his stock, thoroughly disinfect his ground, and after a sufficient interval import fresh and pure blood."

In connection with this and other diseases, we are indebted to the United States and Canada for the many scientific investigations conducted by their Agricultural Departments, in the interest of the poultry industry in that country, and perhaps the most exhaustive and important of them all was that conducted at the California Experimental Station two years ago, and published in Bulletin 161, issued by the College of Agriculture, the following being the introduction:—"The importance of the poultry industry in California has occasioned a demand for the investigation of the problems of poultry management. In response, the Legislature appropriated $5,000 to be expended by the University of California for this purpose, in the manner indicated in the following:—There is hereby established in the county of Sonoma, at or near the city of Petaluma, a poultry experiment station, to be known as the California Poultry Experiment Station. The purpose of said station shall be the study of the diseases of poultry to ascertain the causes of such diseases, and to recommend treatment for the prevention and cure of the same; to ascertain the relative value of the

poultry foods for the production of flesh, fat, eggs, and feathers; to recommend methods of sanitation, and to conduct investigations for the purpose of securing results conducive to the promotion of the poultry interests of the State. This Act shall be liberally construed to the end that the station hereby established may at all times contribute to the technical and general knowledge of the public upon the subject of poultry husbandry."

Tuberculosis in Fowls.

By A. Ward,
Experimental Station, California.

Observations during the past year have demonstrated that tuberculosis is distributed broadly enough to demand the serious attention of poultry-men. The disease exists extensively among many large poultry ranches, but seldom kills enough fowls at any one time to excite the alarm of the owner. Its existence in a flock constitutes a steady drain, but it fails to attract much attention, because the losses are so evenly distributed in point of time. So far, tuberculosis has been observed in grown fowls only. It does not appear to occur in young chicks. In the first outbreak of the disease brought to notice, the owner reported a loss of about 250 fowls during a year out of a flock of 1,400. He had made a large number of *post mortem* examinations, and as the alterations occurring in the disease are readily recognised, the observations have some interest.

Symptoms.—There seems to be no noticeable symptom until the disease has progressed far enough to cause emaciation and weakness. In such cases the breast muscles are found to be wasted away, and the light weight is very noticeable. In the last stages of sickness the affected bird crouches, apparently from weakness. The pale comb, ruffled feathers, unnatural gait, and general attitude are features that attract attention to the victims of the disease.

A very small percentage of affected fowls show tuberculous nodules on the skin of various portions of the body. These may consist of single spherical masses each surrounding the root of a feather, or more often consist of larger masses. These nodules, when occurring upon the head, should not be confused with the swellings that appear on the head in advanced cases of roup (swell head), nor with the wart-like lumps found on the head in chicken-pox.

Facts concerning the length of time that fowls usually live when infected have not yet been secured. One hen, inoculated by injecting crushed tuberculous liver into the abdominal cavity, died in six weeks of generalised tuberculosis.

In most cases the liver is affected. It is found enlarged, and studded throughout with yellowish-white nodules of a more or less cheesy consistency, varying greatly in size and number in different cases.

The nodules are very readily separated from the surrounding liver tissue.

Poultry-men are familiar with the condition, and refer to it as "liver complaint" or "spotted liver." The spleen, in health a small rounded purple organ about half an inch in diameter, is frequently affected with tuberculosis, and in consequence greatly enlarged. Rounded masses of varying size may be found in the walls of any part of the intestines. The mesentery, the thin membrane to the border of which the intestine is attached, is occasionally dotted with nodular masses. The lungs are very rarely affected. Alterations of the bones, joints, or other organs occur more rarely, and are not so readily recognised as the changes described. Most hens badly affected with tuberculosis are very lean, but exceptions have been observed. Tuberculosis is an infectious disease caused by organisms, known as tubercle bacteria, which gain entrance to certain organs of the body and multiply there. The nodular growths (tubercles) so constantly found in tuberculosis are caused by the presence of these bacteria in the affected regions. The spread of tuberculosis from one fowl to another occurs only when conditions permit the transfer of the live tubercle bacteria more or less directly from the diseased to the healthy. The presence of tubercular growths in the walls of the intestine and in the liver suggests that the tubercle bacteria enter the body with the food. The rarity with which tuberculosis occurs in the lungs of fowls would indicate that infection by the inhalation of tubercle bacteria occurs rarely, if at all.

An examination of the tubercular growths located along the walls of the intestine leads to the conclusion that the tubercle bacteria are liberated from the body along with the droppings. A microscopic examination of the contents of the intestine at such points shows that enormous numbers of tubercle bacteria are present. The conclusion that they are liberated through the intestine is unavoidable. The droppings of fowls affected with tuberculosis must, therefore, be regarded as an important factor in the spread of the disease.

No evidence is to hand to indicate that tuberculosis is spread through the egg.

Considerable attention has been paid to the ailments causing the death of young chickens, but no tuberculosis has been discovered among them. The location in which the droppings are deposited bears considerable relation to the probability of that material infecting healthy fowls.

The practice of feeding soft food from the ground affords the best of opportunity of contamination of the food with fresh droppings, and there exists the possibility of conveying infectious materials by the feet to the food outside.

There is no known remedy for the cure of tuberculosis in the fowl. Affected birds should be killed as soon as the existence of the disease is recognised. It is useless to attempt treatment. It must be controlled by measures designed to keep the healthy fowls separated from the diseased ones.

When the disease exists in a flock of fowls, there are usually many in the early stages that do not betray their condition by appearance or behaviour.

There is at present no means of detecting the existence of tuberculosis in a fowl until the affection has progressed sufficiently to produce lameness or emaciation.

There is reason to believe that fowls may be diseased badly enough to make them a source of danger to other fowls, without suggesting by their appearance that they are affected. The tuberculin test so generally used for the detection of the disease in cattle does not give positive results when applied to tuberculous fowls.

Tuberculin is a liquid prepared from beef broth, in which the tubercle bacteria have been cultivated for several weeks. When injected under the skin of cattle affected with tuberculosis, it produces a rise of temperature, usually about 2 degrees above normal. The test in competent and honest hands affords ready means of detecting the disease when other means would fail. Trials upon twenty-one fowls affected with the disease have not indicated that the test may be successfully applied to them, and in view of the unsatisfactory results obtained, it was determined to repeat the work. But even should the tuberculin test prove applicable to fowls, its usefulness would be limited on account of the impossibility of applying it to a large number of them, as would be necessary on a large poultry-farm.

There is no apparent way of recognising all the tuberculous fowls in a flock so that they may be removed. Therefore, all the individuals in an infected flock must be regarded as dangerous to those free from the disease, and must be kept free from them. Fowls suspected of having tuberculosis should be slaughtered promptly. The roosting-houses should be cleaned and disinfected as often as practicable.

It should be remembered that cases which cannot be detected are constantly spreading the germs of the disease about the houses, and, in consequence, the effect of one spraying of disinfectant is of short duration.

Relation to Tuberculosis in Man and Cattle.—The subject of the relationship between tuberculosis in man or cattle and the disease in fowls is full of interest. Tuberculosis in cattle is prevalent in the same district in which the disease occurs in fowls, and examples of tuberculosis in both cattle and fowls on the same ranch have been observed. Attempts to transmit the disease from man or cattle to fowls have usually failed. The possibility of the transmission of tuberculosis from poultry to man is a matter concerning which it is exceedingly difficult to collect evidence.

The fact that fowls when eaten are always well cooked, indicates that there is practically no danger from that source. It has not been proven that tuberculosis is transmitted through the egg; and further, most eggs are well cooked when served. It does not appear, therefore, that tuberculosis in fowls is a matter that very intimately concerns public health.

The experience of most poultry-breeders in relation to the many forms of liver disease is that adult fowls are usually the subjects, and the authority

above confirms this, that no tuberculosis has been found in young chickens, however, during the present season. The writer had an experience in his own yards which, unfortunately, shows that some deaths during chickenhood may be due to a diseased liver. In a flock of cross-bred chickens, four weeks old, two became droopy, listless, and with poor appetite. On the third or fourth day one died, and when dissected the liver was found to be enlarged and covered with pale spots, in size, say, of from $\frac{1}{16}$ to $\frac{3}{16}$ of an inch in diameter, and of irregular shape. I killed the second one, and, through the Chief Inspector of Stock, the liver was forwarded to the Microbiological Laboratory, Department of Public Health, for report, which I duly received, and was as follows:—"The section of liver shows areas of necrosis." In other words, there was a mortification or dying of the liver.

Concerning the cause, there is a good deal of evidence that such is due to a parasite, as shown by the following report, issued by F. V. Theobald, M.A., Agricultural College, Wye, Kent:—

During the past four years several cases of what has been called "infectious entero-hepatitis" have been sent to me for examination. This disease does not appear to have been previously recorded in Britain, but is probably quite common. In Continental Europe its serious nature has been recognised, and in America it has been carefully investigated by several observers. The disease is probably very widespread over both European and American Continents, but there are no records to show whether it is present elsewhere. From what one gathers from the reports of the United States Bureau of Animal Industry, it appears that the disease manifests itself, in America, in turkeys, and is known popularly by the name of "Blackhead." The cases that have come to my knowledge have, all but two, been in fowls. The cause of the disease is a small protozoön called *Amœba melagridis*, of Smith.

The part that parasitic protozoa play in various diseases of man and animals year by year seems to be more prominently brought to our notice. One has only to refer to the malarial fevers and sleeping sickness of man, the red-water and East Coast fevers of cattle, the tsetse disease of horses, &c., to recognise the vital importance of these minute parasitic animals to the health of ourselves and our stock. With regard to our poultry, we know at present little or nothing regarding their complaints except in the crudest of ways.

In this paper I intend to point out the general appearance and effects of the disease, because it has, I find, been more than once taken for tuberculosis, and I should not be at all surprised if many cases of reported tuberculosis of the liver have really been this parasitic hepatitis. Unless carefully-prepared and stained sections of the liver are made it is quite impossible to say what is the cause, unless the other parts of the body are also examined.

Symptoms and Appearance of Diseased Birds.

It is very difficult to note any very marked symptoms until the disease is in a very advanced stage. Diarrhœa is one of the most constant features, followed by emaciation and general weakness. Now and again there seems to be considerable puffiness of the head and a peculiar discolouration, which gave rise in America to the term "Blackhead," in turkeys. This I have seen in fowls, but in two cases in which the effects of the parasites were most marked internally there was no signs of facial discolouration; in fact, it is almost impossible to diagnose this disease in the ordinary way. The *post-mortem* appearances are very marked in both the liver and in the two blind intestinal sacs or cæca. The liver becomes greatly enlarged. In one specimen examined it was quite double the normal size. Over its surface are studded pale spots of a more or less round form, but often irregular in outline. These vary in size from that of a pin's head up to half an inch across; Salmon records them up to two-thirds of an inch in diameter. In colour they vary from grey to mottled pale brown when freshly formed, later they assume a yellow and cheesy appearance. All stages between may be found, the yellow cheesy colour originating in the middle of the pale spots. Those yellow areas represent dead hepatic

tissue, which keeps spreading outwards. These areas not only occur on the surface of the liver, but I have also found them deep in the tissue, and later they become readily separated as hard cores from the degenerating hepatic tissue surrounding them.

If the liver only is examined, and that casually, one may easily be led to assume that it is invaded by tuberculosis; nothing but careful microscopic examination can separate the two diseases so far as I have observed. But besides in the liver, there are marked lesions in the cæca, by which we can at once tell the cause of death. Externally, the two sacs present a swollen and inflamed appearance; the walls become thickened, and dull grey and yellowish masses of exudate arise on the serous covering. The cæca frequently become united to the intestine by this exudate, and even, it is said, to the abdominal walls, but this I have not yet noticed. Internally the sacs become filled with a yellowish-white mass of cells with blood corpuscles intermixed, and the inner walls also become spotted with pale areas similar to those seen in the liver, but smaller. This swollen appearance of the cæca is very important to look out for where we find yellow spots on the liver, as it at once gives us a clue to the true cause of the disease.

The Life-cycle of the Parasite.

The life-cycle of *Amœba melagridis* does not seem to have been satisfactorily worked out. It certainly multiplies in the cæca, not only in the mucous membrane, but also right into the muscular tissue. Reproduction here seems mainly by fission. The masses of protozoa pass into the lumen of the cæca, and so into the intestine. We find exactly the same process taking place in the liver tissue, where the parasites reproduce rapidly and set up the round areas of disease referred to, the parasites killing the tissue and spreading outwards into the sound hepatic substance as the central area dies and the parasites increase. These nidus burst, and thus the amœbæ pass into the bile tubes and so regain the intestine.

How they reach the liver we have no direct evidence, but it is thought by the blood or derived from the cæca. This is probably partly the case, for I have found them in one case studding the spleen. But I am inclined to think that the liver may become infected direct from ingested germs. The disease develops in a very variable manner. It is said from two to six weeks weeks after infection (Salmon) the birds may die. At other times it takes some months to cause any illness, and in some cases birds are said to recover.

Infection

is derived from the parasites passed out in the excrement from both the cæca and liver. These may fall in or come in contact with other birds' food or water, and thus get ingested. The amœbæ then enter the liver and cæca, and soon commence to multiply after penetrating the tissues. Similar organisms have been found in the serous fluid in the swollen heads of affected birds.

Treatment and Prevention.

The treatment of this disease is impossible. In the first place we cannot satisfactorily diagnose the disease. We may, however, suspect its presence in sickly birds in a run, if we find by *post-mortem* appearances that it is present in one or more fowls. If this is the case, it is advisable to clear out our stock and start fresh in a new run or on new land. Runs in which diseased birds have been should be well soaked with carbolic, at the rate of ten parts of carbolic to 100 parts of water, and then the land should be well dug over. To some extent it may be checked where suspected by giving the birds very little *clean* water with salicylic acid dissolved in it. As infection may and probably always does take place direct, it is most important that all unhealthy birds be at once isolated and all excrement carefully removed and the run well cleaned down.

The disease does not seem to be nearly so virulent as tuberculosis in this country, and it is not necessary, with ordinary cleanliness, to get rid of all one's stock at once, as is the case with that bacterial disease.

(*To be continued.*)

Millet Seed.

F. B. GUTHRIE.

As broom-millet is becoming more extensively grown in the State, it may be of interest to draw the attention of *Gazette* readers to the high feeding-value of millet seed, both for human beings and for animals, especially for poultry, which are very fond of it.

Millet seed is used extensively in the East—China, India, and Arabia in particular—as an article of diet, and is quite equal to rice and similar grains in nutritive value. The seeds are used in the form of groats, or made into cakes, which are equal in nourishing value to wheaten cakes. When made from ground millet seed alone the cakes are brittle, but if the flour is mixed with some wheaten-flour it makes good bread.

An analysis is appended of a sample of the seed of broom-millet (*Andropogon sorghum*, var. *technicum*) obtained locally, which shows it to have a very high nutritive value.

ANALYSIS of Millet Seed.

	per cent.
Moisture	12·59
Ash	2·40
Fibre	3·78
Albuminoids	15·56
Carbohydrates	65·38
Oil, &c.	0·29
	100·00
Nutritive value	81·5
Albuminoid ratio	1 to 4·2

Under carbohydrates are included: Starch (about 59 per cent.), sugar (1 per cent.), and about 4 or 5 per cent. dextrin and gum, which cause it to gelatinise when boiled with water.

The ash is rich in phosphates of magnesia and potash.

The grain of *Sorghum vulgare*, one of the millets known as Dhurra or Indian millet, and in the West Indies as Negro or Guinea corn, is also used extensively in the East as human food. It is imported into England as cattle and poultry food, and is grown in southern Europe for this purpose. The culms and leaves of the millets also make excellent fodder.

A table is attached giving a comparison of the sample of broom-millet seed examined with other analyses of millet, and of some of the more common grains. From this it will be seen that the sample examined is poorer in oil than the sample quoted in Wynter Blyth's book. On this account the total feeding-value is somewhat lower. It is, however, much more nitrogenous than the other samples of millet quoted or than any of the other grains, and the albuminoid ratio is consequently much narrower.

TABLE showing composition of Millet Seed as compared with some other common grains.

	Oats.	Wheat.	Maize.	Rice.	Sorghum.	Millet from (Wynter Blyth's "*Foods.*")	Broom-Millet.
Water	11·0	10·5	10·9	14·4	12·8	11·3	12·6
Ash	3·0	1·8	1·5	0·5	2·1	2·3	2·4
Fibre	9·5	1·8	2·1	0·1	2·6	4·2	3·8
Albuminoids	12·4	11·9	10·5	6·9	9·1	11·3	15·5
Carbohydrates... ..	69·8	71·9	69·6	77·6	70·0	67·4	65·4
Fats and oils	1·8	2·1	5·4	0·5	3·6	3·5	0·3
Nutritive value	86·2	88·5	92·2	85·6	87·2	86·6	81·6
Albuminoid ratio	1 to 6	1 to 6½	1 to 7¾	1 to 11½	1 to 8½	1 to 6½	1 to 4¼

OIDIUM OF THE GRAPE-VINE.

M. BLUNNO.

THE only reliable remedy known at present against oidium is the treatment with sulphur. Sulphur is a curative remedy, true enough; but if climatic conditions are very favourable to the development of oidium, even sulphur might not prove very efficacious for the absolute control of the disease, especially on some varieties very liable to it.

It is therefore a good plan to apply sulphur as a preventive as well, and begin before any trace of oidium shows itself. It is certain that oidium is rampant in a vineyard before it meets the naked eye of the vigneron, when in a few days of favourable weather conditions it blazes forth and becomes uncontrollable.

Vignerons generally, if they sulphur at all, begin to apply sulphur when flowers have set. Sulphur, however, may be applied while the vines are blossoming, without causing the slightest injury to the flowers. Also, the remedy may and should be applied early in spring, when the shoots are about 10 to 12 inches long, and keep on, so as to have foliage and crop always well protected.

"Hexham Scent."

IDENTICAL WITH KING ISLAND MELILOT. FARMERS BEWARE!

J. H. MAIDEN.

FOR some time past a melilot growing in King Island, Bass' Straits (between Victoria and Tasmania) has been extensively boomed, chiefly by means of the Press, in Tasmania, Victoria, South Australia, and New South Wales. It has been sent out as *Melilotus officinalis*, but it turns out to be a common weed pest of New South Wales, *Melilotus parviflora*, or "Hexham Scent."

Numbers of correspondents have written to me on the subject, but I could only warn them not to sow the seed until I could get authentic specimens from King Island. So far I have not been able to get them, various excuses being made, although it is said to be very abundant.

Recently, however, Mr. Harold W. Robinson, of "Woodlands," Gosford, has sent specimens to the Department that he had grown from King Island seed, and his specimens are those of *Melilotus parviflora*, our "Hexham Scent," execrated by dairy-farmers and wheat-growers.

Specimens received from South Australia also turn out to be *Melilotus parviflora*.

The King Island plant may do all that is claimed for it there, but let the King Island people keep it, and not assist in further disseminating a pest in New South Wales.

Following are extracts from notes published by me in the *Agricultural Gazette* for 1895 and 1902, respectively:—

HEXHAM SCENT (*Melilotus parviflora*, Desf.).

Owes its smell to the presence of coumarin, contained also in Tonka beans. The odour is therefore agreeable in its proper place, but people object to it in their flour. When mixed with grain causes decrease in price.

"A very prolific seeder. Introduced into the district through the agency of winds and birds. Careful agricuturalists experience little or no difficulty in keeping it in check." (Rothbury.)

"Frequents good alluvial lands, either cultivated or non-cultivated; also the public roads, by which means many weeds are spread. Many farms in the district are perfect seed-beds for noxious weeds, and this weed is spreading with great rapidity." (Comobello.)

"Introduced in seed grain. First observed about two years since, and is now spreading rapidly throughout the district. It is asserted that the seed of this weed becomes mixed with grain from which it cannot be separated, and the result is that it imparts to the flour an unpleasant taste and smell." (Armidale.)

"A very bad weed." (Woolomin, Tamworth.)

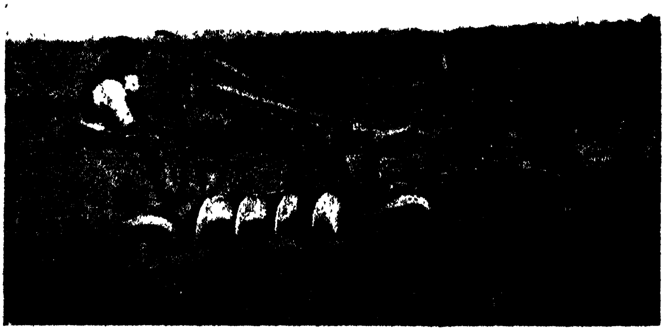
"Very troublesome in wheat crops. While many of the farmers cut it down, others make no attempts to keep it in check, thereby seeding their neighbours' clean lands." (Mudgee.)—(*Agricultural Gazette*, April, 1895, p. 231).

HEXHAM SCENT (*Melilotus parviflora*, Desf.).

[See the *Gazette* for April, 1895, p. 231.]

The following note on this weed is from the pen of Mr. Thomas Wall, junior, Model Farm, Woolomin, Tamworth.

"'Hexham Scent' has been a nuisance here for the past twenty-five years. It grows splendidly in wet seasons. Frost will not injure it. It thrives best in cultivated land. If milch cows are fed on it in the spring September or October—when sappy, the odour of the milk and butter is most objectionable to taste and smell. If at night I chance to be walking among the milkers that ate 'Hexham' the day before, their breath is not very sweet. Milk drawn from the cow also smells. If 'Hexham' is cut with any hay, such as wild oats or wheat, horses will get hungry before they take to eat it (the hay). If reaped with a crop of wheat and bulked for some time for the thrasher, millers will be short of wheat if they buy it, as the flour smells. In fact, in new-baked bread, the smell is most pronounced. I have seen crops of wheat growing some years ago in which the 'Hexham Scent' took sole possession of patches in the paddocks. It was a plague to farmers during past wet seasons, but it is getting scarcer the last two or three dry seasons we have had."—(*Agricultural Gazette*, New South Wales, March, 1902, p. 313.)



Hawkesbury Agricultural College and Experimental Farm.

HEDGES: THEIR PLANTING AND CUTTING.

HUGH REID,
Gardener, Hawkesbury Agricultural College.

A HEDGE properly includes every kind of fence; but the following remarks apply solely to growing fences.

When properly planted and kept in good order, a hedge is a great shelter and a lasting ornament to any place, and will add considerably to the value of a property.

It is advisable in this State to plant hedges on the level ground, on account of the long spells of dry weather and the hot winds which prevail during the summer.

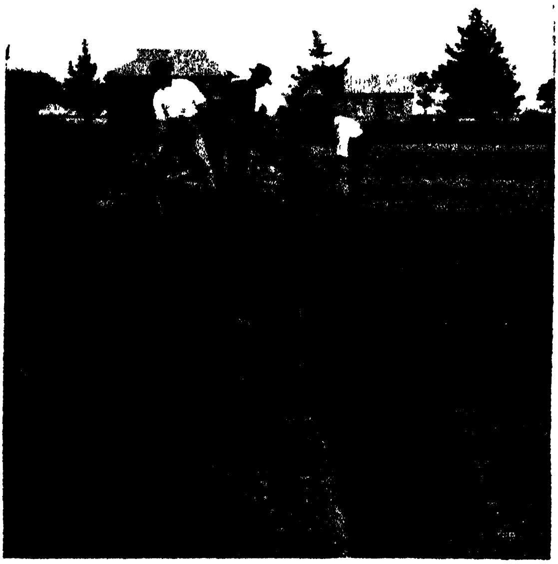


Fig. 1.—Preparing trench to plant hedge.

Where the ground is swampy, however, it is necessary to form a bank on what is generally called a turf wall, 2 or 3 feet above the ground level, tapering on both sides, and about 2 feet broad on top. Then a line should be set in the centre of the bank or turf wall, and a little trench cut out. The rooted cuttings are planted against the back of the trench, where the line is set, and the planter will have little difficulty in keeping the cuttings in a straight line. Where the turf has been removed to form the bank will now act as a drain to take away the stagnant water which probably will lie about.

Illustration Fig. 1 shows a trench for a hedge 18 inches wide and a good spade deep. The students are putting manure in the bottom of the trench,

and covering with a light layer of soil. In illustration Fig. 2 the students are then seen placing the plants up against the straight solid wall. The roots are covered with a little soil and well watered, and the trench filled up with the remainder of the soil. When this is done it is advisable to look along the row of plants to see if any of them are out of place. When the plants are made firm, cut them each to 6 or 8 inches from the ground, and dig the ground for about 3 feet on each side of the hedge.

With regard to the general culture of these hedges, it must be remarked that all such as are exposed to cattle must, as soon as planted, be fenced

Fig. 2.—Students planting hedge.

either with a temporary stake and bush hedge, with hurdles, or with a light post and wire fence for four or five years, till the hedge grows up, taking care not to place the fence too close to the hedge. The hedge must also be duly weeded while young, especially during the first two years.

In order to preserve hedges in proper form, they must be clipped on the sides and tops at least once a year, and, if possible, oftener. The best time for the first cut is midsummer, with the second cut in April or May. The shoots should always be cut the same season while in leaf, and before they become hard. The work may thus be performed more expeditiously and with greater exactness, as the cutting should be as

even as a wall on the sides, and the top as straight as a line. After the hedge is formed to its proper width, the growth should be cut as nearly as possible to that of the former cut, particularly on the sides. They should never be allowed to grow more than a foot or 18 inches wide, or too much on the top.

When the cutting cannot be carried out more than once in the year, the clipping should not be performed until the end of April or May in this State, for if cut sooner they will shoot again, and appear almost as rough all the winter as if they had not been touched.

High hedges are very troublesome and expensive to keep in proper order.

Illustration Fig. 3 indicates how to start to cut a hedge. About a foot from the bottom should first be cut away in order to leave room for a clear stroke of the knife up the side of the hedge, holding the blade of the knife a little on a slant, with the edge of the knife towards the hedge, so that it will cut everything, even the smallest twig.

Fig. 3.—Starting to cut a hedge.

Illustration Fig. 4 shows the students cutting the side of a young hedge of *Ligustrum pubescens*, commonly called Japanese privet. It is a very quick grower, and if not cut hard back, and often, it will get top-heavy, and hang down and look unsightly.

Illustration Fig. 5 indicates how to cut the top of a hedge with a hedge-knife to save expense. To make this stroke, it is necessary to hold the handle of the knife with the right hand near the top of the handle, the left hand near the blade. Standing along the side of the hedge, the eye must be got on to the exact height that the hedge is to be cut back to, and the knife held down in a slanting position a little behind the left leg; then, when the stroke is taken, some force must be put into it with the left hand, at the same time taking care to let the handle of the knife go with the left hand. When the stroke is half completed—that is to say, the force is pushed into the stroke with the left hand till the knife is nearly in front of the breast—let go the handle with left hand, so that

the knife when the cut is completed will have a clean sweep round the head. The knife must be drawn back to the side each time, and the stroke always started from the same position. When the cut on top of the hedge is finished right through on one side, the other side must be started to complete the top. When this is done it will be sloping like the roof of a house. If the hedge is desired to be flat on top, it must be cut with a pair of hedge shears or secateurs, which will be much more expensive and tiresome to cut than with the knife only. It is quite a pleasure to cut with the knife when one has had a little practice. Where a hedge has always been clipped with shears, it will be very difficult to cut with the knife; therefore the best thing to do would be to cut the hedge hard back.

Fig. 4.—Students cutting the side of hedge.

When that is done properly there will be little trouble afterwards in keeping the hedge in good order.

One of the students here cut the side of a salt-bush hedge 11½ chains long in two and three-quarter hours, without ever having had a hedge-knife in his hand before.

Illustration Fig. 6 depicts two students cutting a *Ligustrum lucidum* hedge, also commonly called Japanese privet. The first is cutting the side of the hedge, using what is named the up stroke. The second is levelling the top, each stroke of the knife going round and over the head.

A hedge of Old Man salt-bush (*Atriplex nummularia*) is shown in front of illustration Fig. 7, and *Ligustrum pubescens*, or Japanese privet, behind.

Fig. 5. -Cutting the top of a low hedge.

Fig. 6.—Students cutting the side and top of a high hedge.

Fig 7.—Hedges at the Hawkesbury College. Front—Old Man Salt-bush; back—Japanese Privet.

The necessary hedge-cutting tools are shown in illustration Fig. 8:—1. Hedge shears; 2. Pruning saw; 3. Hedge knife; 4. Old scythe blade made into a hedge knife, for light work, such as the soft shoots of a hedge before the wood has set hard. A great amount of work can be got

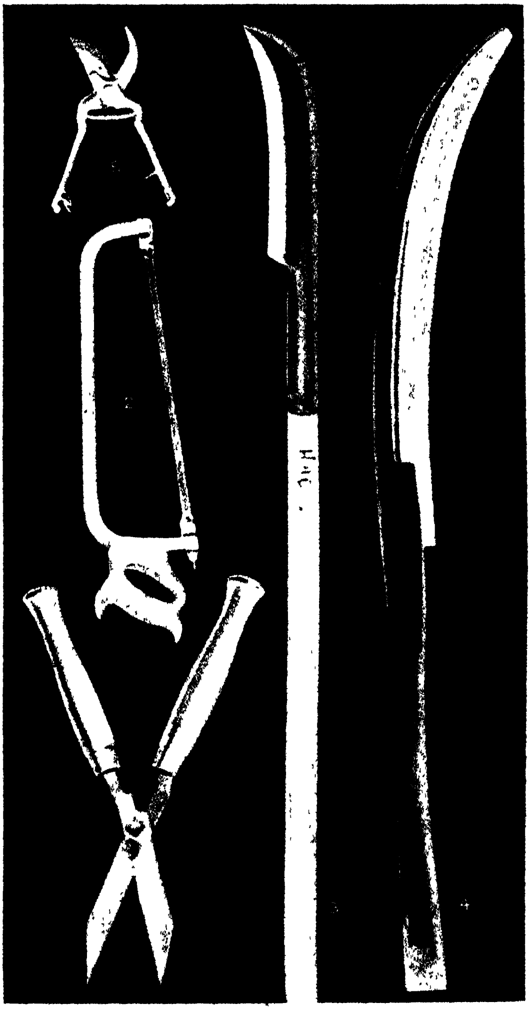


Fig. 8.—Tools for cutting hedges.

over with a knife of this kind in a day. It is also very handy to have about a place to cut grass in ditches, &c.; 5. Secateurs.

Fig. 9 is an example of an uncut hedge, while Fig. 10 shows the same hedge after being trimmed in the manner above described.

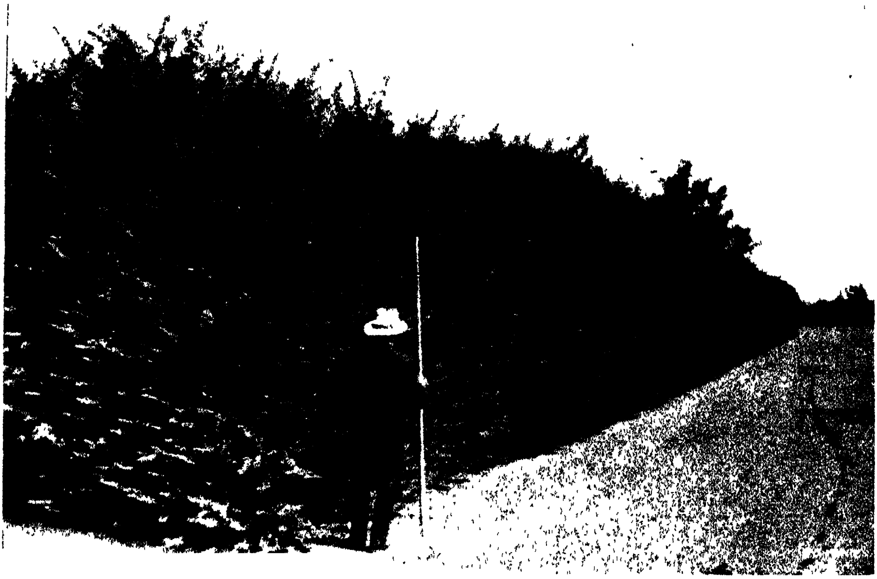


Fig. 9.—*Ligustrum pubescens* (a Japanese Privet) hedge at Hawkesbury Agricultural College. Before cutting.

Fig. 10.—*Ligustrum pubescens* **hedge. After cutting.**

PLANT PROPAGATION.

HUGH REID,
Gardener, Hawkesbury Agricultural College.

Propagation by Cuttings.

A CUTTING for propagation is an entirely detached portion of a plant, usually a shoot or part of a shoot, furnished with buds and leaves. When properly selected, duly prepared, and placed under favourable conditions, the cutting forms a callus, which resembles in some respects a wart on the human hand. From this callus roots will be emitted, and thus an individual plant is formed, which may again be increased to an extent corresponding to the number of parts eligible for cuttings which the plant can afford at once or in succession.

For instance, if a plant be cut over level with the surface of the ground, and consequently be deprived of its nourishment from the roots, it will, notwithstanding, remain alive, and its buds will continue to attract the sap from the vessels with which they are connected, and will expand into leaves. These, as well as others with which the cutting may be furnished, will continue to perform their functions almost as well as before the separation of the plant from its roots—that is to say, they will elaborate the sap till all that can be drawn from the cutting is exhausted. It will continue to form cellular tissues, and so long as this is formed, it will naturally flow along the proper channels as far as possible. It will descend from the leaf by the vessels in the petiole or leaf-stalk, and by the inner bark of the shoots, depositing secretions and forming woody tissues in its progress. It is not, however, usual for the tissues organised by the leaves to be wholly monopolised by the stem and its parts above ground, for whilst a certain quantity is thus appropriated, a considerable portion passes on to the roots and adds to their growth and extension. If a plant be 3 feet in length from a certain part of a shoot to the extremity of the roots, the sap elaborated by the leaves on that part deposits more or less substance throughout the whole length of 3 feet; moreover, if the soil be in a favourable condition, especially as regards temperature, an extension of the extremities of the roots is effected. If a cutting 6 inches in length below the leaves is made, presuming it to continue its functions as usual, the cutting will receive and appropriate the share of elaborated sap due to a length of 6 inches, while the tissue not so appropriated, and which would have extended 30 inches further towards the extremity of the roots, accumulates where the channels of communication with the latter are cut off, *i.e.*, at the base of the cutting. Here it forms a callus of organised matter, which, under favourable circumstances, protrudes and ultimately assumes the form of roots, and the cutting has become a plant. This result, however, depends upon various circumstances, to which it is necessary to advert. The cutting requires to be of the proper age, inserted at the proper season, and in a suitable medium, and should

afterwards be kept in a well-regulated condition as regards heat, moisture, and light.

Selection of Wood.—Cuttings should be taken from healthy plants, and from such parts as are not in a weakly state, for if the shoots or branches are not in a condition to make a fair growth with a supply of nourishment from the roots of the parent, they cannot be expected to possess sufficient energy when made into a cutting to make a good plant. At the same time, excessively vigorous shoots accustomed to receive an abundant supply of nourishment, are not so well able to keep alive, when deprived of that supply, as others that have been less highly fed. Some kind of trees, such as the willow and poplar, strike from either the old or young wood; but most strike more readily and make the better plants from well-matured shoots from the current year's growth. In the case of hard-wooded plants which are difficult to strike, considerable nicety is required in selecting the portion of the shoot suitable for a cutting, the wood of which is neither too old and hard, nor too young and soft. In the former case, roots are not readily emitted, while in the latter the cuttings are apt to damp off. A knowledge of the proper degree of firmness which the cutting should possess can only be acquired by practice, especially as this differs in different plants. When not exactly known, it is well to insert cuttings of various degrees of firmness, and observe for future guidance the condition in which they succeed the best.

Time of taking Cuttings off.—The cuttings of hardy deciduous trees and shrubs should be made after the fall of the leaf, and before the sap rises in spring, as the sap is then in a condensed state. As it expands by the increased warmth of spring, the buds swell, and the sap is returned to form callosities, and the more readily if placed in soil that is moist and warm. The worst time for taking the cuttings of this description is when the sap is in full flow, and when the leaves from the buds formed in the previous summer are just expanding. At this period they evaporate the moisture contained in the leaves with great rapidity, and at the same time return organised tissue but slowly, so that before enough of it to produce roots is accumulated the cutting is exhausted. As a general rule, cuttings should be taken off either when the plant is in a dormant state, or when it is active and has made a new shoot, with leaves so far matured as to be in the act of forming an abundance of woody tissue.

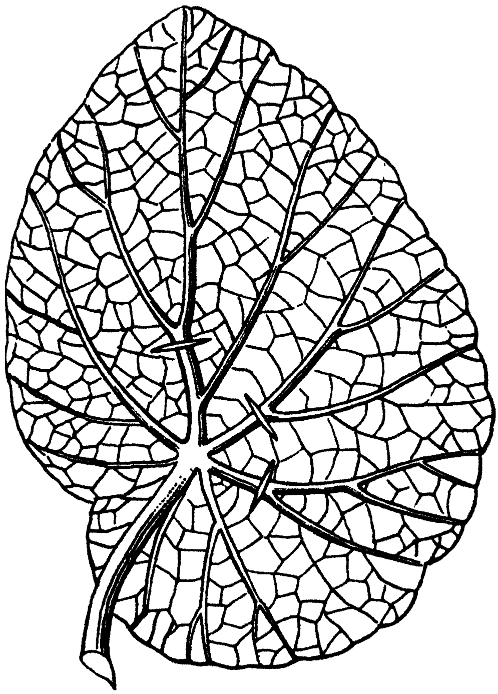
Preparation of Cuttings.—Cuttings of gooseberry, currant, and some other kinds of plants, emit roots not only from the callus at the lower end of the cutting, but also along the sides. In these and other kinds of cuttings from deciduous trees, the buds on the underground part must be cut, picked, or rubbed off, otherwise they will sooner or later push into shoots, and produce an inconvenient number of suckers. It may be observed that in the gooseberry and currant the leaves have chiefly performed their office when the fruit has ripened, and as this occurs early in the season, cuttings made at this time and planted in warm, moist soil will form roots before the winter, and will consequently be ready for

Cuttings prepared—showing most suitable lengths.
(See scale of inches.)

vigorous growth early in the ensuing season, and before cuttings of the same sort inserted in spring could have formed a single root; thus the cuttings made early in the autumn will be nearly a year in advance of those planted in spring. These illustrations are quoted as familiar examples of what may be observed and taken advantage of in regard to the propagation of other plants. In such cases the leaves must be taken off, otherwise they will evaporate the moisture of the cutting. When plants are difficult to strike by the ordinary mode of cutting off a portion of a branch or shoot for immediate insertion, it is a good plan to ring the shoot below a joint about midsummer; the returning sap being checked, a swelling commences above the ring and continues to increase till active vegetation ceases in autumn. The branch should be cut off below the ring and laid in the soil till spring, in order that the swelling may be softened by the moisture of the soil, to facilitate the emission of roots. In the spring the cutting is taken up and the ringed portion cut off close to the underpart of the swelling; the cutting is then inserted in the soil to the proper depth, the top having been previously shortened to a few buds above the joint corresponding to the surface. The cutting is left until the autumn, and then removed to its proper quarter.

With regard to the preparation of evergreen cuttings, and the importance of allowing the leaves to remain on the cutting, some people prefer leaving them all. I find, however, that by so doing the leaves remaining on the cutting have a great tendency to damp off, and cause decay. It is common among practical gardeners to cut with a sharp knife, or a pair of secateurs, very neatly under the bud or joint, and remove three or four of the lowermost leaves, then cut the leaves across the top to avoid taking up too much space, and also to prevent damping off. Then take a box or pan about 4 inches deep, put a few holes in the bottom of it, place some pieces of broken pots, charcoal, ashes, or other rough material over the holes for drainage, and fill up, first with a thin layer of leaf-mould, and place above a light layer of a compost of two parts light loam, one part leaf-mould, one part sand, and one part well-decayed manure and a little powdered charcoal, well mixed together; finally, fill up with pure clean river sand, seeing that the sand is free from decaying matter, as otherwise it will induce putrefaction. The sand is porous, and affords a ready passage for the spongioles (*i.e.*, the soft white ends of the rootlets), yet being fine it retains moisture by capillary attraction. The sand contains very little nourishment, and, as a matter of fact, very little besides what may be dissolved in the water is required till the rootlets begin to be formed. The sand should also be free from oxides of iron. After firmly pressing the contents of the box, take a pointed stick, or what is known as a "dibber," and insert the cuttings, taking care not to injure the bark when making the cutting firm with the stick. When the box or pan is filled, place in a cold glass frame, and keep the frame shaded and fairly warm for a short time. The best time for such cuttings to be planted in this State is June or July.

Cuttings of hardy plants which strike in the open air are sometimes inserted by means of a dibber, but it is always better, when circumstances will permit, to cut off by a line a straight edge in the soil, and place the prepared cuttings against it, pressing the soil closely around them. In preparing the cuttings for the open air, such as roses, planes, ligustrums, and a great many other trees and shrubs, it is advisable, after the cutting is ready for insertion, to tie each variety in small bundles, make a hole in the ground deep enough to allow the cuttings to be turned upside down, and cover all 4 or 6 inches deep for a few weeks. This causes the cuttings to callus very much more quickly; as soon as they have formed this callus, take out and plant where wanted in the nursery, at the same time being careful not to expose the cuttings to the sun. A piece of wet bag should be used to prevent this exposure, which will blacken the callus and spoil the cuttings. The callus will not stand pushing into the soil, and a little trench must be opened out and the cuttings laid in gently.



A leaf cutting, showing the position of incisions on the lower side.

Propagation by Leaves.

The first attempt on record to raise a tree from a leaf was made by Mandirola, an Italian horticulturist, an account of whose methods was published by Richard Bradley, in the beginning of the last century. It is now advantageously practised with such plants as the gloxinias, gesneras, echeverias, and a few of the begonias.

It has already been stated that roots and buds have their origin in, and derive their rudimentary substance, either directly or indirectly, from the leaves. This being the case, it might be possible to propagate most plants in this way, provided they could be kept alive after being detached from the stem long enough to allow of a sufficient quantity of cellular matter being elaborated and protruded from the petiole, or from the section of the mid-rib, to form granulated callosities for the production

of spongioles and adventitious buds. The leaves of some plants, whilst not detached, return cellular tissue abundantly to the roots by the process of digestion and continuous supply. The crude sap which leaves are capable of containing is in some plants quickly elaborated, and as quickly replaced; although all the sap which such leaves contain at any instant may afford but a very small quantity of matter available for the formation of roots, yet when the supply is continuous the amount may be very considerable in the course of several weeks. If a piece of clean paper were dipped in a solution of salt and water, and then exposed to evaporation in the sun, the quantity of salt left on the paper would be imperceptible to the naked eye; but let a supply of the solution be repeated as evaporation proceeds, and ultimately an incrustation of salt will be formed on the paper. Somewhat similar must be the case with some kinds of leaves; they may be full of sap when attached, but this, when elaborated and returned to the section of the petiole, would not be in sufficient quantity to form a callus.

The selection of leaves intended for striking is of importance, and they must not be either too young or too old. The energy of young leaves is employed towards their own growth, and should not be diverted. On the other hand, leaves that are old may be considered to have performed their functions, and are therefore on the eve of becoming inactive, or even of entering a state of decay. Leaves which are very nearly full grown are to be preferred, and these will generally be found in the middle part of the shoot. Some plant-raisers recommend that the petiole be inserted its whole length, while others prefer to cut the petiole close to the base of the blade. The foot-stalk, or whatever part of it is left, should be inserted up to the base of the blade in pure white sand, laid over sandy peat, or other compost suitable for the growth of the plant, after the leaf has struck root. When the foot-stalk is cut off close to the base of the blade, the latter should be laid on its back, and the base slightly inserted in the sand, in which it should be kept by a peg, or a small stone should be placed upon it. The leaves, thus placed in contact with moist sand, should be covered with a bell-glass, the edges of which must be well pressed into the sand; they should then be placed in a greater bottom heat than is required for cuttings of the same kind of plant: the glass must be shaded at first, and although the atmosphere within should be moist, yet it should not be too much so. If the leaves are in a state to absorb moisture from the sand, it will in that case prove beneficial to allow the air within the bell-glass to be occasionally a little below the point of saturation, or, in other words, it may at times possess a very slight degree of dryness. Instead of a bud being formed from a callus of tissue at the section of the petiole or the mid-rib, buds are in some cases emitted from the indentations of the margin, as in *Bryophyllum calycium*, a species of house leek, chiefly regarded as a curiosity; a single leaf laid down on a damp surface will throw out young roots all round its margin. As it is a native of the East Indies, it requires a summer temperature of 60 to 85 degrees.

(To be continued.)

New South Wales Citrus Fruits in London.

W. J. ALLEN.

THE oranges and lemons which were despatched from Sydney by the R.M.S. "Orotava" on the 29th of June, reached London in splendid condition—the Navels bringing very satisfactory prices, ranging from 7s. to 16s. 6d. per case, the greater number bringing from 12s. to 16s. 6d. A few cases of Jaffas were included, and these brought from 10s. to 10s. 6d. per case, while the common varieties were sold at from 5s. to 9s., according to quality. Mandarins sold at 5s. 9d. per case, while lemons brought from 3s. to 5s. 3d.

Passion Vine on Trellis.

Passion-fruit, which is not yet well known on the London market, was practically given away, bringing from 1s. 6d. to 6s. per case. I feel confident that when once it is known among the better class in England, there will be a big demand for this fruit. Nothing can compare with it in flavour—it gives the necessary piquancy to a fruit-salad; is used as a flavouring in the icing of cakes; eaten with cream it cannot be surpassed (when thoroughly ripe); and is largely used here for flavouring ice-creams and water-ices; and when the tops are cut off and the contents eaten with a teaspoon, and no embellishment used, it is certainly not a fruit to be despised.

The passion-fruit which reached London in the best condition was that packed in boxes, while those which were sealed in air-tight cases were worthless.

About nine years ago a small shipment of this fruit was sent to London, and arrived there in splendid condition. It was wrapped and packed in cases, which allowed of the passage of a certain current of air; but there was a sheet of strong paper placed between each layer.

It cannot be said that this shipment of fruit was a financial success, but it proves that our citrus and passion fruits can be landed in good condition on the European market; and I predict that when our better class of fruits become known there will be a good demand for them, and the growing of certain varieties of these fruits for export can be made a very profitable industry.

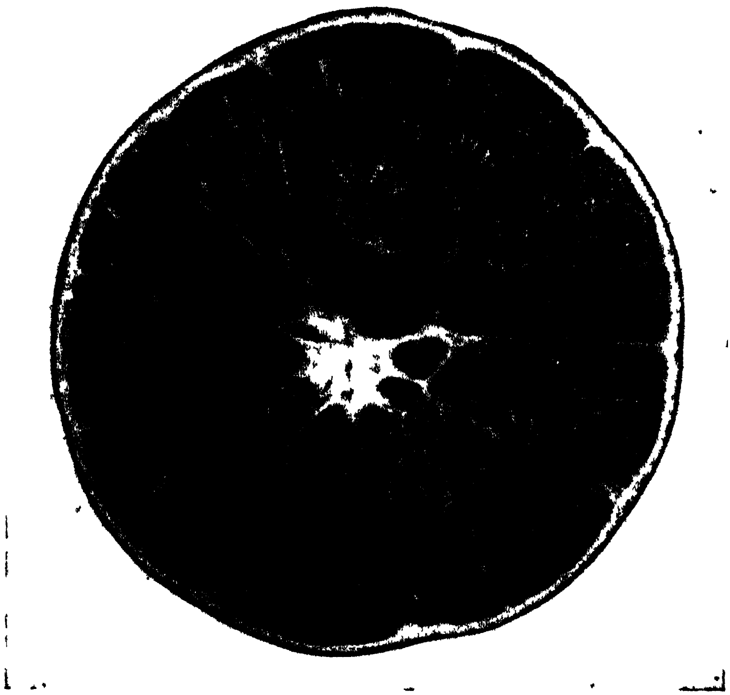
Wherever the soil is at all good throughout the orange-growing districts of the State, south of Muswellbrook, and where we have hundreds of acres of Seville and common varieties of oranges which are not returning very much to the growers, these, if grafted, to Washington Navels, could be made to pay handsomely. For a good many years the impression seemed to prevail that this variety would not crop with us, but we find that the Washington Navel carries fair crops if the trees receive proper care—that is, keeping them free from diseases, working the ground well, and keeping the trees well manured. There was a variety of Navel largely planted in the early days, and of a very upright habit, which proved itself a very shy bearer, and thus earned a bad reputation for the Navel; but I am pleased to say that most, if not all, of these trees have been worked to other and better varieties, and in consequence we do not hear so many complaints as to this variety being a shy bearer.

Where Sevilles are to be reworked to Washington Navels, it is best to cut them off near the ground, just where the orange was budded or grafted on to the stock, and the scions inserted in the stock close to the ground (where cut off). If this is done in the early spring, the grafts will take readily, and by the fall these will have developed into a good tree, which will carry a fair crop at two or three years after grafting in this way.

After the Washington Navel, the Jaffa appears to have brought the best prices. This is a good sweet orange, with very few seeds, and of nice size, and when thoroughly ripe is one of the best to eat. The Valencia Late is another, but, owing to the lateness in ripening, is hardly sweet enough for export to Europe in June or July, but is about in proper condition to send to America in August, September, and October, when such fruit usually commands a good price there.

If we can reduce the expenses of packing, marketing, and cool storage of fruit between here and Europe, so as to keep the total expenses (case and packing included) to from 4s. 6d. to 5s. per case, I feel confident that

we will find it profitable to export some of our fruit each year, and it is a good way of relieving our own market of the surplus fruit. About 3,000 cases were sent in the cool chambers this year, and I feel sure that it will always be found best to use small chambers, such as will carry about this number, rather than large, for the storage of this fruit on the boats. We may even find a fair market for good lemons at certain seasons, but it would be wise to ascertain the tone of the market before sending the fruit. Last year lemons were commanding a good price in London, while this year they were cheap.



The size of orange most suitable for export

According to reports furnished, the larger oranges are in the greatest demand; medium will find a sale, but small ones are not wanted.

The following is the report of Messrs. Edward Jacobs and Sons, on the shipment of oranges, &c.:—

"*Oranges.*—The greater part of the fruit arrived in very fair condition, but we found a large proportion wanting in quality and size. We may mention that if this business is to be brought to a success, inferior quality and small fruit must not be shipped. The expenses of freight, &c., are too heavy to allow common fruit to be sent. Therefore, we strongly advise shippers only to send best large and selected fruit. The packing of some of the fruit left a great deal to be desired. Each orange should be packed in

a kind of silky or oily paper, the same as used in Tasmania for packing apples, and not the ordinary common white paper. In the event of one or two oranges in a case decaying in transit, the paper referred to would prevent the rot running into the other fruit. The fruit should be tightly packed in the case and no room must be left for it to roll about. The bad and wet condition in which some of the fruit arrived is no doubt due to various circumstances. In order for oranges to travel well, it is essential that they are packed during dry weather. The fruit requires cutting and placing under cover a few days before being packed, so as to allow the outside moisture to dry. Taking into consideration the cool summer we are experiencing, and the quality of the fruit, we consider the prices realised are very fair. On the other hand, as we have already explained, if best quality selected fruit were shipped, and provided that the summer is a normal one, we have every reason to believe that this business could be brought to a success.

"*Lemons.*—This is also a fruit that entirely depends upon the weather. Last summer, when we experienced very hot weather, lemons sold at high prices. It has been the reverse this summer; we consider there will always be a speculation in shipping Australian lemons. Some seasons it is possible they would sell very well, whereas in others, like this one, where the weather is cool and large quantities are arriving from Italy and Sicily, there is scarcely any demand for Australian lemons.

"*Passion-fruit.*—We do not hold out very great prospects for the sale of this article here. There is no market value whatsoever attached to it. Here and there, if it is inquired after by a few colonials, a big price could be obtained, but this is not to be depended upon, and any great quantity shipped to England would have to be sacrificed or given away. The appearance of this fruit is greatly against its sale. It is very ugly to look at, and not at all tempting; and as appearance goes a long way in England, we do not consider there is anything to be done with it."

Speaking of the above report on Passion-fruit, I quote from a letter which appeared in the *Pall Mall Gazette* of the 22nd August last, over the name of Mr. Murray Eyre:—

"A representative of the firm who had received the consignment, which was one of about thirty cases, told me that, finding few buyers on the previous day, they had actually given all the fruit away, but were regretting their hasty generosity, as numbers of people had since been wanting it, and one of the Agents-General had made an offer of 12s. a case for the whole lot. The people who know the fruit want to get it, he remarked, and I daresay if any more is sent we shall be able to sell it. The big hotels are asking for it now it has been written about in the newspapers."

Flax.

[Continued from page 605.]

J. LINTOTT TAYLOR.

WE now come to the treatment of the retted flax straw into fibre by machinery. It must however be remembered that a small quantity, say from 40 acres to 50 acres, will not do more than clear cost of machinery, labour, and freight, for the first year, and this supposing the yield to have been the average. If the same area can be cultivated each year then profits will begin, and continue; for assuming the machinery is all procured, an annual yield even less than a fair average will give a fair profit.

Provided the grower has in his property, one of the many kinds of engines, so frequently advertised, he can use it for all purposes where such power is required.

This almost absurd statement is made because the writer has actually been asked, by one of his many correspondents on the flax question, if a special engine would be needed for treating the straw into fibre. Of course any engine will do equally well, and the amount of horse-power required will soon be ascertained. It may perhaps be mentioned that, as advertised, the oil and gas engines do not need such close and constant attention as the ordinary steam engine, for being once set at a given power and speed, they will run for hours without any attention, thus saving the man who is needed constantly to attend to the wants of the ordinary engine.

For driving the necessary machinery, an engine of 5 or 6 horse-power will be amply powerful enough. One grower of flax in Victoria has assured me he has done excellent work with a 4 horse-power oil engine. At the same time it is well to remember, that an engine will not be needed only for this purpose, so it is best to have an extra 1 or 2 horse-power in reserve for other requirements on a farm.

Having secured an engine for the motive power, a thresher, already described, will be needed. This being bought, and the seed extracted and stored, we shall need a more complicated machine called the breaker. It must be borne in mind that though the straw may be properly retted, it yet requires a treatment called breaking. This process in itself demands skill and care. The breaking process consists of loosening the straw, which is useless, from the valuable fibre, the straw being crushed and broken into very small portions, from an inch and shorter, and so enabling it to be easily combed away from the part to be retained for sale. The breaker machine consists of a series of fluted rollers, between which the straw is drawn in, as hay is drawn in to a chaff-cutting machine, only it is not cut but worked from one end to the other of the breaker, and so rendered fit for the next process. This consists of a beating or brushing operation, removing a lot of useless straw, and passing

it on ready for the scutcher. The action of the scutcher thoroughly cleans the straw remaining, away from the commercial article, the fibre, which is the flax.

The scutcher consists of two upright sides, across from one to the other running the axle that carries the small driving wheel, and the 6 or 8, generally the latter, wide bluntly-sharpened boards that revolve, like the spokes of a wheel without a rim. These scutchers rotate very quickly indeed, and just miss in their revolutions the side of the machine, which is iron plated, but with no sharp cutting edge to cut the fibre. The broken straw is passed in, so that the edge of the wide boards as they revolve bear away from the straw all the remaining portions, and leave the fibre clean.

As the straw can only be thus treated when very dry, there will necessarily be a lot of dust rising, and to obviate any undue and unpleasant results, the revolving boards are hidden by a specially-made cover. As the fibre is passed into the scutcher it is firmly held, as evenly as possible, and of as equal a length of straw, and therefore fibre, as can be obtained, otherwise the shorter portions might be drawn away and lost. The fibre being thus treated is withdrawn, and carefully placed on one side.

The fibre should not be exposed to the weather, as the straw may be, not that any weather would injure the material itself, but it would require a long operation to dry it again before it could be sent to market. It is well, then, to treat all the machinery under cover, protecting from wet especially.

As the fibre is brought to its finished state it is just as well to pack it for market; the material being of such a soft, silky nature can easily be pressed into any shape. It is not tied up like bundles of straw, but put into wool bales, and can then be pressed in an ordinary press for wool or straw. This being done, the flax fibre is ready for an ever-waiting, ever-growing, and ever-unsatisfied market, and the grower can forward it feeling confident of obtaining an excellent return and certain profit.

Below is a list of machinery required and approximate expenses to be incurred for treating 1 acre:—

	£	s.	d.
Ploughing, sowing, and seed	1	0	0
Harvesting	0	15	0
Threshing	0	12	6
Carting and spreading	0	11	0
Harvesting after retting	0	10	0
Breaking and scutching	2	15	0
Carting fibre and seed	0	5	0
Interest and depreciation of machinery ...	0	10	0
	£6	18	6

The fair average returns per acre are as follows:—

12 bush. linseed at 14s. per cwt.	4	4	0
5 cwt. fibre, at £45 per ton	11	5	0
	£15	9	0

Thus showing a mean average of £8 10s. 6d. per acre.

The gross return from 100 acres is estimated at £1,545. The linseed varies in value from £14 per ton to £20 per ton.

The fibre is as a rule always worth £45 per ton.

These figures do not include wages, they being no charge especially on the flax, unless directly employed.

The cost of machinery without the engine will be about £70 to £80, according to cost of freight. The engine can be of any value according to means. These calculations were made for the writer by an expert in Victoria, and by no means is a maximum, but leans to the minimum.

The machines required are—without the engine—a thresher, a breaker, a combing machine, and a scutcher.

As far as the writer knows there is only one firm making these machines, and that is Messrs. Cliff and Bunting, North Melbourne, though there may be such a manufacturing firm in New South Wales.

Mangolds at Bathurst Farm.

R. W. PEACOCK.

An experiment was carried out upon the wheat soil of the uplands of this farm to test the effects of certain applications of manures.

A variety test of Yellow Globe *versus* Sutton's Golden Tankard was also carried out.

The yields are not heavy, but give evidence of the effects of manuring. The season was a comparatively favourable one.

Paddock No. 7.

Variety—Yellow Globe. Date sown—18/9/05. Harvested—17/9/06.

Plot.	Manure.	Yield. Tons.	cwt.	qrs.	lb.
1	No manure	8	19	0	16
2	Superphosphate, 3 cwt. / Sulphate of ammonia, 1 cwt. } per acre . ..	12	0	1	20
3	No manure	5	13	0	26
4	Superphosphate, 3 cwt. / Muriate of potash, 1 cwt. / Sulphate of ammonia, 1 cwt. } per acre	15	16	1	12
5	No manure	7	10	3	12
6	Muriate of potash, 1 cwt. / Sulphate of ammonia, 1 cwt. } per acre . .	12	0	1	20
7	No manure	8	9	2	24
8	Muriate of potash, 1 cwt. per acre	14	7	2	8
9	No manure	5	13	6	26
	Average of unmanured	7	5	5	9
	Variety Test.				
1	Yellow Globe	11	6	1	4
2	Sutton's Golden Tankard	8	16	3	14

Note on the Effect of Lime upon the Availability of the Soil Constituents.*

F. B. GUTHRIE AND L. COHEN.

THE experiment here described was undertaken with the object of determining to what extent the availability of the soil-constituents is affected by the addition of lime.

Three kinds of soil were used in the experiment—a light sandy soil, a garden loam fairly rich in humus, and a very stiff clay soil.

The soils were well mixed, passed through a sieve with a 1 millimetre mesh, and about 10 lb. of each placed in an ordinary 11-inch terra-cotta unglazed pot, closed at the bottom with a cork. Duplicate portions, sifted as above, were thoroughly mixed with 1 per cent. freshly-slacked lime, and potted in duplicate.

The pots were placed for a month in a position exposed to sun, rain, and wind, and kept moist the whole of the time. On three occasions they were saturated with heavy showers, but did not overflow.

The clay soil which had been treated with lime had undergone considerable physical change, having become quite friable and easily broken up by the fingers at the end of a fortnight.

At the time of filling the pots, samples of the original soils in an air-dried condition were taken for the determination of the plant-food soluble in hydrochloric acid, citric acid, and water. The analyses are as follow :—

ANALYSES of Original Soils.

		Clay.	Loam.	Sand.
Soluble in HCl. Sp. gr. 1·1 ...	CaO	·742	·827	·109
	K_2O	·241	·103	·031
	P_2O_5	·184	·348	·074
Soluble in 10 per cent. citric acid	K_2O	·0115	·0254	·0055
	P_2O_5	·0405	·1674	·0317
Soluble in distilled water ...	K_2O	·0057	·0061	·0027
	P_2O_5	·0027	·0026	·0019

After the pots had stood a month, the soil in each pot was well mixed and all lumps broken up, after which a fair sample was taken, without sifting, and dried at air temperature.

For the citric-soluble determinations, 100 grammes of air-dried soil were placed in a Winchester with a litre of 1 per cent. solution of pure citric acid, the bottle being then fixed in a mechanical-shaking apparatus (end-over-end motion), making approximately fifty revolutions per minute, and shaken continuously for twenty hours.

With this solvent, it has been shown by A. D. Hall that no further quantity of phosphoric acid or potash goes into solution after that time. The shaking being completed, the Winchester was allowed to stand in an

* Read before the Royal Society of New South Wales, 7th August, 1907.

upright position for some hours, after which the clear supernatant liquid was syphoned off and filtered through a dry paper.

Of the clear filtrate, 500 c.c. were taken and evaporated to dryness with about 50 c.c. of nitric acid. The residue was then ignited gently at a low heat, and, on cooling, taken up with hydrochloric acid, using the molybdate method for P_2O_5 and the platinic chloride method for K_2O.

To obtain the water-soluble extract, 200 grammes air-dried soil were shaken in a Winchester, with a litre of distilled water, for twenty hours in the above-described apparatus. After standing for about six hours the clayey liquid was syphoned off and filtered under pressure through a Pasteur filter-candle by means of a force-pump.

500 c.c. of the clear filtrate were evaporated to dryness with a few drops of HNO_3, proceeding in the same manner as for citric-soluble.

The results of the analyses are given hereunder.

Water Soluble.

(*a*) Phosphoric acid, P_2O_5.

	Original	Standing.		Limed.		Increase.	Decrease.
		1 month.	Mean.	1 month.	Mean.		
Sand	·0019	·0006 ·0007	·0007	·0029 ·0037	·0033	·0026	......
Loam	·0026	·0004 ·0006	·0005	·0022 ·0025	·0024	·0019	.....
Clay	·0027	·0008 ·0007	·0008	·0019 ·0018	·0019	·0011	.....

(*b*) Potash, K_2O.

	Original	Standing.		Limed.		Increase.	Decrease.
		1 month.	Mean.	1 month.	Mean.		
Sand . .	·0027	·0018 ·0019	·0019	·0038 ·0039	·0039	·0020	....
Loam . .	·0061	·0045 ·0043	·0044	·0048 ·0046	·0047	·0003	......
Clay	·0057	·0007 ·0009	·0008	·0038 ·0030	·0034	·0026	.. ..

Citric Soluble.

(*a*) Phosphoric acid, P_2O_5.

	Original.	Standing.		Limed.		Increase.	Decrease.
		1 month.	Mean.	1 month.	Mean.		
Sand	·0317	·0315 ·0302	·0309	·0315 ·0308	·0312	·0003	.....
Loam	·1674	·1860 ·1770	·1815	·1802 ·1782	·1792	......	·0023
Clay	·0405	·0423 ·0429	·0426	·0210 ·0272	·0241	......	·0185

(*b*) Potash, K_2O.

	Original.	Standing.		Limed.		Increase.	Decrease.
		1 month.	Mean.	1 month.	Mean.		
Sand	·0055	·0074 ·0067	·0071	·0087 ·0074	·0081	·0010	......
Loam	·0254	·0196 ·0190	·0193	·0221 ·0221	·0221	·0028	......
Clay	·0115	·0113 ·0113	·0113	·0118 ·0110	·0114	·0001	......

The analyses were made in all cases on the air-dried soils. The moisture was determined in each case, in order to apply corrections if necessary.

No corrections were made, as the water-contents were fairly constant, but the figures are given below.

MOISTURE-CONTENT of Soils.

	Original.	Standing—1 month.	Limed—1 month.
Clay	6·36	8·07	8·94
Loam	3·99	2·02	2·89
Sand	1 69	·19	·26

There are one or two points to be noted in these tables. In the first place, the amount of mineral plant-food (phosphoric acid and potash) soluble in water has suffered a very considerable decrease during the period of the experiment, notably the water-soluble phosphoric acid in all soils and the potash in the clay soil.

The action of liming has been in all cases to produce an increase in the quantities of water-soluble plant-food over the unlimed; but it is only in the sandy soil where liming has had the effect of increasing the proportion of water-soluble phosphoric acid and potash above those originally present in the soil.

There was no vegetation in the pots, and no drainage except through the walls of the pots, and the samples for analysis were taken by mixing the whole of the contents, and not from the surface layer only.

It would therefore appear that there is a steady loss of water-soluble plant-food during the period, either by percolation through the sides of the pot or by conversion into insoluble plant-food.

Whether the lime present prevents this reversion of the water-soluble plant-food, or whether it renders fresh plant-food soluble in water, is not shown by this experiment.

In the case of the citric acid soluble ingredients, there has been very little appreciable alteration in the quantities after standing—in some cases there has been an actual increase.

The effect of liming is much less marked than with the water-soluble plant-food. In the case of the phosphoric acid there is an actual decrease in this constituent, especially in the clay soil.

In the case of potash, the increase is also much less than with the water-soluble potash, except in the case of the garden loam.

Portions of the unlimed and limed soils were also examined, in order to ascertain the effect of lime on the soluble nitrogen.

The pots had by this time been standing eight months in a dry state. The soil was well mixed, and a weighed portion shaken for a few minutes with nitrogen-free water, in the proportion of 1 gramme of soil in 2 c.c. water.

The extract having been filtered through porcelain under pressure, 2 grammes of purified "vegetable black" were added to about 250 c.c. and stirred for twenty minutes. The whole was filtered again through a Pasteur candle, the filtrate being then, as a rule, completely decolourised. In two cases, however, the treatment with "black" had to be repeated before a perfectly colourless solution was obtainable.

The carbon used for this purpose was the ordinary "vegetable black" of commerce, containing large quantities of paraffin oils.

It was purified by heating to redness in a covered crucible, and when cool lixiviating three times with hot nitrogen-free water.

For the determination of ammonium salts, portion of the filtrate from the soil, after decolourisation, was nesslerised direct.

The nitric nitrogen was determined by the phenolsulphonic-acid method, and the nitrous by the starch method.

The results are given below.

NITRITE NITROGEN.

	Unlimed.	Limed.	Increase or Decrease.
Clay ...	·4	3·6	+ 3·2
Loam	·1	2·0	+ 1·9
Sand..	Nil.	·7	+ ·7

NITRATE NITROGEN.

	Unlimed.	Limed.	Increase or Decrease
Clay ...	8·0	5·0	− 3·0
Loam	4·5	4·5	.....
Sand...	·2	·4	+ ·2

The interesting point about the above figures is the large increase in the proportion of nitrite nitrogen in the limed soils. The total nitrogen as nitrite and nitrate has increased in all cases, and the nitrate-nitrogen has remained almost stationary, except in the clay soil. It would not, therefore, appear that the production of nitrites is due to any process of denitrification, but rather that, under the conditions of the experiment (vegetation being absent and the soil undisturbed), the action of lime is to promote the development of the organisms which convert the ammoniacal soil nitrogen into nitrous acid.

The figures for ammoniacal nitrogen do not throw any light on this point, for the decrease in ammoniacal nitrogen after liming is undoubtedly largely due to loss of ammonia, the limed soils all giving off a distinct odour of this gas. The figures obtained are, however, given.

AMMONIACAL NITROGEN in parts per million of soil.

	Unlimed.	Limed.	Increase or Decrease.
Clay	8·2	1·0	-7·2
Loam	5·3	1·6	-3·7
Sand...	5·3	·8	-4·5

The fact that there has been no loss of the very soluble nitrites and nitrates would indicate that the diminution of water-soluble potash and phosphoric acid previously noted is not due to percolation through the walls of the pots so much as to conversion into less soluble forms.

It is our intention to continue these experiments under conditions which will afford more precise information concerning the various questions involved.

ANSWER TO CORRESPONDENT.

R. WALKER.—Mr. Waley has kindly supplied the following replies to your inquiries:—

How Weights are put on top of Silage.—After the silo is filled within about a foot of the top, it is allowed to settle and then again filled up, after which it is covered with wet thatching straw and weighted down with old posts and rails.

Distributor.—With regard to particulars of distributor, I would refer your questioner to the Ohio Company's catalogue, which can be obtained from Jas. Martin & Co., or Anthony Hordern & Sons.

Acid Corroding Cement.—With regard to the acids in silage corroding the cement, the question of what acids are generated in the process of silage-making is still an open question, and a great deal more experiment is required before any definite answer can be given. My opinion only is that the process of decomposition set up in silage-making results rather in ferments of an alcoholic character than an acid, but, in any case, I am able to say that no damage is done nor corrosion set up in the cement.

Blower and Chaff-cutter.—With regard to the cost of these, the question is again referred to the Ohio Company's catalogue.

Deering Maize Reaper.—This was purchased from the International Harvester Company of America, and full particulars can be obtained on application from the firm named.

Engine.—With reference to the cost of the engine, I would advise your questioner to consult with some good machinery firm. The question as to whether an oil engine will suit him better than a steam engine, whether a portable or a fixed type, and a hundred and one other questions to be settled in a case of this kind have a most important bearing on the cost of the machine installed, apart altogether from the question of the horse-power required. My own engine is a portable Robey, 10 h.-p. steam engine, the cost of which, new, would amount to about £550; but this engine has other work to do, including pumping in connection with an irrigation scheme. For the work of cutting and elevating ensilage a 10 h.-p. oil engine would be found considerably cheaper.

With reference to the details of construction, the designer, Mr. E. G. Stone, C.E., Werrington, should be consulted.—SUB-EDITOR.

Experiment with Sweet Potatoes.

A. H. E. McDONALD,
Experimentalist, Hawkesbury Agricultural College.

TRIALS were made during the past season with six varieties of sweet potatoes, to ascertain their yielding capabilities.

The plants were raised in a hot-bed, and transplanted in the first week of November. The rows were made 3 feet apart, and the plants set at distances of 2 feet in the row. The soil was of a light sandy nature, experience having shown that good results are obtained from such land. No manure was applied; but a crop of cow-pea vines had been ploughed under after the ripe grain had been harvested. When the plants were well established and began to send forth leaves, the soil was cultivated each way to check weeds and prevent, as much as possible, the loss of moisture by evaporation. After this, two further cultivations were given between the rows. The vines quickly covered the ground, and no other attention was necessary until the crop was fit to harvest.

Full particulars of the method of raising the plants and the cultivation of the sweet potato are given in the *Agricultural Gazette*, Vol. XV, Part 8.

The following rainfall was registered during the time the crop was in the ground :—

November.		December.		January.		February.		March.		April.		May.	
Dates.	Points.	Dates.	Points.	Dates	Points.	Dates.	Points.	Dates.	Points.	Dates	Points.	Dates.	Points.
3	3	6	2	2	13	5	8	3	4	8	10	3	46
8	9½	9	2½	9	1	7	78	4	86	14	3	17	1
12	6	12	16	15	9	8	42	5	59	15	1	30	10
18	8	13	1	18	3	10	1½	10	13	16	94	31	2
14	57	18	29	19	3½	12	1	11	1½	17	39		
15	2	19	3	27	78	13	2½	13	2½	22	1		
27	38	20	1	28	39	18	8	14	13	30	31		
28	34	25	42	30	3	26	21	15	76				
29	5	28	7½			27	84	16	78				
								17	35				
								19	1				
								20	1				
								23	11				
								24	36				
								25	5				
								27	5				
	162½		104		149½		246		427		179		59

Total, 13·27 inches.

It will be noticed that up till the end of the third month the rainfall was small, and chiefly precipitated in light showers.

The roots were a good size, and sufficiently mature for table purposes by the end of March; but as it was desired to obtain the maximum yields, harvesting was delayed until the vines were cut down by frosts in the beginning of June.

The following results were obtained:—

YIELDS OF SWEET POTATOES.

Planted 2nd November, 1906, and harvested 7th June, 1907. No manure applied.

Variety.	Yield per plot. Area $\frac{1}{20}$ acre.				Computed yield, per acre.											
					Table potatoes.				Pig potatoes.				Total yield.			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
Pierson...	1	2	1	16	11	8	0	0	11	0	0	0	22	8	0	0
Pink	0	17	0	0	14	19	0	0	2	1	0	0	17	0	0	0
White Maltese	0	14	0	5	11	12	0	0	2	9	0	0	14	1	0	0
Big Stem Jersey Yellow	0	11	0	0	9	18	0	0	1	2	0	0	11	0	0	0
Short Stem Jersey Yellow	0	9	0	5	7	1	0	0	2	0	0	0	9	1	0	0
Jersey Red	0	8	2	5	7	9	0	0	1	2	0	0	8	11	0	0

It will be seen that Pierson gave the highest returns, but that a considerable proportion was unfit for table purposes. This was owing to the way the roots cracked and opened in the ground before they reached maturity. Many of the roots of this variety were extremely large, some weighing up to 8 lb., and it is probable that this excessive expansion was the cause of the splitting. Although this defect rendered them unsuitable for table purposes, it did not detract from their value as stock-food, for the roots were perfectly sound otherwise. The other varieties gave a comparatively small quantity unfit for market; and in every case where there was any loss, it was due chiefly to the small size of the roots.

The flavour of the different varieties differs considerably, and certain kinds, whilst possessing a flavour liked by some people, are disliked by others. Pierson is soft and squashy, with a rather poor flavour. This, with its tendency to crack, renders it a somewhat inferior kind for table use.

The Pink variety is inclined to be soft and squashy, but possesses a good flavour. It is a heavy yielder and a good table potato, except that it grows rather large.

White Maltese is a long potato, and a heavy yielder. In quality it is somewhat mealy, and is generally well liked. When exposed to frosts the flavour becomes disagreeable.

Big Stem Jersey Yellow is not a heavy yielder, but can be recommended for the table, on account of its shapely appearance and its not over-large size. It is a rich yellow in colour, and possesses a somewhat peculiar flavour, which is well liked by many people.

Short Stem Jersey Yellow is somewhat similar in appearance to Big Stem Jersey Yellow, and is a good table sort.

Jersey Red is a small, shapely red potato, and whilst fresh is the most favoured of all the varieties. It is not a heavy yielder, but is recommended for small gardens on account of its short vines. When exposed to frosts it acquires a bad flavour, in the same way as White Maltese.

The crop as a whole was remarkably free from disease of any kind. A few decayed roots were found; but the quantity lost in this way was small. This freedom from disease is obtained by adopting a system of changing the site each year, so that the crop is not sown on the same soil more than once in three years. In the meantime other crops are taken, including a crop of cowpeas, grown to be ploughed under to increase the humus in the soil and keep up its condition.

It was found that the best method of keeping the potatoes was to allow them to remain in the ground, covered by the dry leaves and stems. This method can be adopted with perfect safety where the ground is high and well drained; but if it becomes over-saturated with water, the crop is liable to decay. The roots grow slightly above the surface of the ground, and when the vines do not provide sufficient covering to protect them from frost, they acquire a disagreeable flavour, which renders them totally unfit for human consumption. Scantily-leaved varieties, such as White Maltese and Jersey Red, suffer most in this respect. Where small areas are grown, the quality of the roots can be better maintained by putting a covering of straw, a few inches deep, over the bed.

The yields obtained indicate the value of this crop for districts having an uncertain rainfall, or where the soil is poor and sandy. The rainfall table shows that the early part of the growing season was remarkable for its dryness. Ordinary crops, such as maize and common potatoes, when grown under such conditions, become stunted, ripen prematurely, and fail to give a profitable return. This was the case in the district during the present season, most of the early-sown crops proving failures. The sweet potato, on the other hand, has a long growing season, and should the rainfall prove insufficient at any one period of its growth, it is not very seriously affected. It remains at a standstill, but retains its vigour and a healthy condition, and is ready to take advantage of every light shower which falls. In even the driest districts a fair rainfall is generally obtained during the summer months; but in most years it falls at irregular periods, and much of its value is lost to such crops as maize, owing to it not being received at the time it is needed. The power the sweet potato has of tiding over fairly long periods of drought renders it very suitable for such districts.

Its preference for sandy, open soils is another point which makes it well worthy of more extended cultivation. The land selected was light and sandy, and the yields show how valuable this crop is for such soil. We have many areas of similar land scattered through the State, which, owing to their lack of plant-food and the rapidity with which they part with moisture, are incapable of producing heavy yields of the ordinary crops. The sweet potato thrives to perfection on such soils, and provides a means whereby the returns derived from them may be much increased. In an American publication it is stated that "the sweet potato can endure more heat and drought than any other root crop. Turnips, parsnips, carrots, beets, &c., succumb and wither at a time when the

conditions are just right for this crop. Hence our dry and hot seasons, which seem to increase in their torrid character, produce this splendid esculent in the highest perfection; and we may rely upon it when all other root crops fail. This should induce all who have the proper soil to plant the sweet potato freely for home use, if not for market."

Whilst not likely to displace the potato in its position as a vegetable, its use could be increased as a valuable supplement to it, and at times as a substitute. In the city markets it is well known; but its cultivation could, with profit, be more largely entered into, especially in the hotter districts, where the potato does not thrive, and supplies have to be obtained in the Sydney markets. In the warm States of America it occupies a prominent position as a vegetable, and only requires to be made better known here in the right places to become popular. Great opportunities exist in some of the inland districts for extensive growth. Farmers of the Winter Schools at the College were much impressed by the prolific yields, and professed their intention of trying it in their various districts.

Apart from its value as a vegetable, the sweet potato is extremely useful as a food for stock, particularly pigs. It is not expensive to grow, as 1½ cwt. of seed will produce abundant plants for an acre. The only tedious work in connection with its growth is transplanting, and this can rapidly be done by good workmen. In addition to the high yield of roots obtained, a large quantity of vines and leaves are produced, which have a high feeding value, and are greedily eaten by either cows or pigs.

The following average analyses of sweet potato roots and vines, grown at Barbados, will be found of value:—

	Moisture.	Oil.	*Albuminoids.	†Amides.	Starch.	Fibre.	††Ash.	*Containing Nitrogen.	†Containing Nitrogen.	*†Containing Total Nitrogen.	††Containing Phosphoric Anhydride	††Containing Potash.	††Containing Sand.	Value in Units.	Albuminoid ratio 1 to—
Roots.	65·60	·48	1·30	38	30·00	1·05	1·29	·21	·07	·28	·18	·37	·39	34·8	20·3
Vines..	80·43	2·07	·64	2·24	6·09	5·79	3·58	·33	·12	·45	·25	·45	1·10	14	3·2

The roots are rich in carbonaceous or fat and heat producing material, but are rather poor in protein, or the flesh-forming constituents; and if fed without the vines, require balancing with some more nitrogenous food, such as peas or beans. The vines are rich in nitrogenous matters, and if the crop is fed off so that vines and roots are eaten together, a fairly good ration is obtained; but even then the addition of more concentrated food would improve its value. It is more economical to adopt the practice of feeding off than to harvest the crop and hand feed. The labour of harvesting is avoided, and the manure left on the ground by the pigs has the effect of maintaining the soil in good condition. When it is carried out, the pigs should not be allowed to roam at will over large areas, but should be confined by hurdles on small spaces, which

they can quickly eat over, and then be moved on to a fresh portion. When the roots are disturbed, as they are by the pigs rooting, they quickly decay, and if the area is large a considerable amount of loss will occur. Some care is necessary in feeding the vines. It is stated that in their young stages they have a poisonous effect on stock; but this passes off as the crop reaches maturity, and they become perfectly safe to feed. The vines and roots are at their best for feeding in autumn, just before frost, while the vines and leaves are still green.

Rabbit Destruction.

E. R. SCOTT,
Inspector of Stock, Moree.

AMONG the numerous methods of rabbit destruction which have been noted from time to time in the papers of the day, I have not noticed any reference to the system of tar-sealing with straw and tar.

This system has been tried with success in this district, and is, shortly, as follows:—Take a bundle of grass or straw the size of the opening of the burrow to be operated upon, and tie a piece of bagging about 6 inches in width on the end of this, and dip the bagging end in *coal tar*, and stuff the bundle, tarred end first, into the burrow as far as it will go, then fill in the mouth of the burrow with earth, and the operation is complete. All similar openings to be treated in the same way.

It would naturally be concluded that the rabbits would immediately burrow out, but the fact is that they do not do so, but *die* in the burrows.

This system has been tried with complete success in this district. First on Mr. W. Campbell's Burwood property, where about 400 acres of low-lying land, which was practically "honeycombed" with burrows, was treated with complete success; again on several adjoining properties with similar results, and recently the Pastures Protection Board have treated 800 acres of somewhat similar country at a cost of about 4½d. per acre: 1,176 burrows and 720 holes were treated. The cost of material—coal tar, straw, and bagging—being £4 11s. and labour £10. Total, £14 10s. 6d.

On most holdings, especially in farming districts, the cost of the tar would be the only item outside of labour; old bags and straw being usually on hand.

Digging out the burrows is admitted to be one of the most effective means of dealing with the rabbit pest, but so far as our experience in this district has gone, this system appears to be equally effective, and the cost not to be compared. It is necessary that hunting to secure the rabbits shut out of the burrows should be conducted simultaneously, as in every instance in which burrows were re-opened, it was found that it was the outside rabbits, and not the inside ones, which had opened the burrows. As a matter of fact, the cases in which burrows were re-opened were remarkably few.

Ostrich Farming.

GEORGE VALDER.

THE export of ostrich feathers from South Africa is steadily increasing. During the past year (1906) 547,709 lb. of feathers, of a value of £1,406,159, were sent away. So valuable is this industry becoming to Cape Colony that in order to better protect it the Cape Government is bringing in a Bill to prohibit the exportation of ostriches and ostrich eggs. Although for some years past a duty of £100 has been levied on every ostrich taken out of the Colony, and £5 on every egg exported, it is stated that this has not quite prevented exportation. The Bill now before the House makes it unlawful to send an ostrich out of the country, and provides the very severe penalty of imprisonment for a year or more.

Ostrich farming in South Africa is pretty well confined to the Cape, only a comparatively small number of birds being kept in the other Colonies.

There are two systems of farming adopted: in some cases the birds are run upon large areas and are kept almost in a wild state, whilst in others they are kept on smaller areas, and are either hand-fed or grazed on cultivated crops, such as lucerne, rape, &c. It is generally considered that irrigated lucerne is the best grazing crop for ostriches.

The best quality feathers are obtained from the wild birds, and it appears that the more the birds are confined the more likely is the plumage to depreciate in quality. On the other hand, when the birds are kept in small areas and well fed, they yield much heavier pluckings. From information obtained from several of the leading ostrich farmers, I gathered that on the large runs the average plucking was worth about £3 per bird, and on the cultivated areas the average would be about £4 10s.

Many farmers adopt the plan of grazing cattle on their farms in order to eat down the long grasses. It is found that the ostrich usually only eats the short succulent grasses, and therefore the farmer first runs cattle on the land, then gives it a short rest, and as soon as the grass has made a good shoot, the ostriches are turned in upon it. In this way it is stated that farming pays very much better than in running ostriches alone.

The greatest care must be taken in selecting and mating the birds, in order that their stamina, and the beauty of the plumage, may be kept up and improved. The Cape farmers, recognising the importance of this, pay big prices for new blood to improve their strains. It is stated that

as much as £1,000 has been paid for a pair, and from £200 to £300 has on several occasions been paid. As a rule, however, good birds can be purchased at about £20 per pair.

Regarding the yield of feathers from an ostrich, it seems that the average in Cape Colony is about 1½ lb. per bird, and if we take the average price per lb. for the year 1906, viz., £2 11s. 4d. per lb., this gives £3 17s. as the yield per bird. I have heard of individual birds carrying plumage which was valued at £25 per plucking; but this is very exceptional, and I believe the amount of £3 17s. quoted as the average for Cape Colony is a high one. On the other hand, the Cape Minister for Agriculture (Hon. Arthur Fuller) recently stated that a farmer in Eastern Province of Cape Colony had obtained an average yield from his flock of 2,000 birds, during the year 1906, of £6 per head—*i.e.*, £12,000. This result is stated to be due to some years of careful selection in mating and proper feeding of the birds, together with the high prices ruling for feathers during that year.

As a rule, the ostrich breeds once a year, and can hatch some sixteen to eighteen eggs. Should the farmer, however, wish to increase his flock rapidly, he adopts the plan of either heavily feeding the birds and not allowing them to sit—in which case they keep on laying, and the eggs are hatched in incubators—or allowing them to sit and then taking the chicks away as soon as they are hatched, in which case the hen again lays, and thus several broods can be obtained from the one pair of birds in the one year.

From what I could gather during my stay in Cape Colony, it seems to me that there is a great similarity between the districts where the ostrich thrives best and some of our inland districts, and that the only difference is that, generally, our land is of better quality. The ostrich thrives well in poor, dry country—in fact, at the Cape it is stated that country where the grass grows thick is not suitable for ostriches, as it is a dweller in deserts, and ought to thrive in places where even a goat cannot live. I have seen them doing well in districts where there was little or no grass, and where the country was covered with either short scrub or prickly-pear; in fact, they will eat prickly-pear when they can get at it, and the farmers now use a specially-constructed chaff-cutter to slice up the pear-plant for them.

Regarding the area required for ostriches, I think that a fair estimate is to allow at least three times the area allowed for a sheep, as it is generally considered that an ostrich eats as much as three sheep.

I should much like to see this industry taken up here on a large scale, as I believe that we could just as successfully produce good feathers as the farmers at the Cape are doing; in fact, we should do better, as the climate is quite as suitable, and we have better country and a better rainfall.

Butter Trade with South Africa.

GEORGE VALDER,
Government Commercial Agent.

During the past two years the Cape Government, and in a lesser degree the other South African Governments, have made strenuous efforts to foster the production of butter locally, with the object of at least inducing the dairy farmers to increase their output sufficiently to supply local requirements. The Cape Government obtained the services of a gentleman from Ireland to lecture upon co-operation, and to give special attention to the starting of co-operative butter factories. Acting upon this gentleman's advice, advances were made to several co-operative butter factory companies of from £4,000 to £8,000 each, to enable them to put up suitable buildings, to instal up-to-date machinery, and, in fact, to give them a fair start in every way.

These efforts have resulted in an increased production; but, generally, I believe the factories have been a financial failure. The reason for these failures is undoubtedly that stated in my report of 1905, viz.: "The small area of pasture lands suitable for dairying, and the limited number of really good milch cows available, makes it almost impossible to increase the milk-flow sufficiently to keep a factory properly supplied." Besides this, the dairy farms are really few in number, and are generally situated at great distances apart; it is therefore difficult to obtain an even quality of cream, and the result is that the quality of the butter is often unsatisfactory.

The Customs returns for 1906 show that the operations of the factories have had little effect upon the imports of butter.

The following table shows the quantities imported, the value, and the countries from whence the chief supplies were obtained:—

Butter, 1906.

	lb.
Australia	5,082,359
Argentina	4,043,641
New Zealand	1,295,712
France	401,154
Holland	208,410
Canada	149,659
Other countries	92,813
Total	11,273,748

Valued at £539,353.

As 1906 was the first year in which statistics were published dealing with the imports into the whole of South Africa, it is difficult to get a

proper comparison with the imports of the previous year, as the returns given for previous years were for British ports only. The returns from the latter for 1905 show that 10,451,949 lb. of butter, of a value of £461,207, was imported, and as there was only a small quantity coming through foreign ports, we may conclude that in 1906 the imports of butter were much the same as those of 1905.

Comparing the 1906 with the 1905 returns, it will be found that both Australia and Argentina show an increase in the quantity supplied; the year was a record one for Argentina butter, but the Australian total for 1906 was not equal to that of the years 1903 and 1904, and it appears that whereas Argentina is steadily improving her position with regard to the South African butter trade, Australia is making little or no progress. The trade with all other countries is rapidly decreasing, and as with meat so with butter, the competition for the South African butter trade is now practically narrowed down to Australasia and Argentina.

The advantages claimed for Argentina butter are that, in the first place, as a rule, it is placed on the market more quickly than Australian, *i.e.*, it is less time in cold storage, and it therefore has a freshness which is often lacking in Australian butter; secondly, large quantities can be supplied which are quite even in quality; and, thirdly, the pale colour of the Argentine butter is greatly favoured by South African consumers.

The great advantage with Australian butter is that, as a rule, it keeps better than Argentine. On the other hand, often when large supplies are obtained buyers complain that the quality is very uneven.

With regard to the colour of Australian butter, I noted that South Africans are not the only people to complain, as in their market report for the 28th December last, Messrs. Mills and Sparrow, of London, stated:—

Australian.—"Many of the factories are too high in colour for the general trade, a medium colour being most in demand."

Argentine.—"These butters are arriving in fine order, and selling, in many cases, in preference to Australian, on account of the paler colour."

Argentine butter has so improved in quality during the past year or so, that it is now often taken in preference to best Australian, and although we now receive ¼d. per lb. rebate of duty, this will not be sufficient to protect us unless some improvement is soon made in the faults described above.

The quantities supplied by each State were as follows:—

	lb.
Victoria	3,612,062
Queensland	1,003,735
New South Wales	450,862
South Australia	13,500
Tasmania	2,200
Total	5,082,359

Valued at £237,737.

Report on Experiments in Cotton-growing.

C. W. McCOY,
Public School, Carr's Creek, Grafton.

THE experiments were carried out in accordance with the plan arranged with the Director of Agriculture. The plot measured 50 ft. by 16 ft. The experiment extended over one year.

The first sowing was destroyed by a hail-storm in November, 1906, when 2 feet high.

We then planted afresh the thirteen varieties received, and, of these, the only one that did not come up was Abassi. This variety also did not yield in the first crop.

Of the others, Egyptian, Peterkin's, and Tool's Early Improved did worst. Out of a planting of about fifty seeds, only three of each of the two first named came up, and five plants of the last. However, the average yield of cleaned cotton and cotton seed per acre of these varieties compared favourably with the other varieties, as will be seen from the appended results, which were all very carefully compiled.

Of the remainder, Culpippers and Sea Island Short Staple gave a yield of about one-half hardy plants.

The balance, viz., Jones's Re-improved, King's Early Improved, Griffin's, Lewis's Prize, Carolina, Sea Island (Extra Long Staple), and Russell's Big Ball, gave a yield of between 80 and 90 per cent. of hardy plants.

The plants were grown on a gentle slope with an eastern aspect, and the soil was a sandy loam of only fair quality, much inferior to the average farm soil that is found almost anywhere within a radius of 5 miles.

Certainly, it was new land in the sense of having lain fallow for the ten years previous to 1906. Before the boys here took it in hand, it had a crop of buffalo on it averaging 18 inches in height.

We had comparatively little trouble with the Boll Worm, and had just an average amount of rainfall for the first three months, but one much below the average for the last five months the crop was in.

The seeds were planted in rows, 4 feet apart, with 16 inches between the stools. The rest of the seeds were planted broadcast outside the experimental area, in case of accident. (Distributed to pupils.)

They were put in to a depth of 2 inches, after having been soaked for twenty-four hours. When about 3 inches high, they were thinned out, leaving one plant to the stool. I might here state that I planted three seeds at each stool, and, as far as I could discover, the crickets did not do any appreciable damage. I think crickets were scarcer than usual.

The average heights of the various varieties were—Sea Island (Short Staple), 7 ft. 6 in.; Jones's Re-improved, 6 feet; Griffin's, Lewis's Prize, Sea Island (Extra Long Staple), and Russell's Big Ball, 5 ft. 6 in.; Carolina, 5 feet; Culpippers, 4 ft. 6 in.; Peterkin's and King's Early Improved, 4 feet; and Tool's Early Improved and Egyptian, 3 ft. 6 in.

Of the dozen that gave a yield, Russell's Big Ball, Carolina, Jones's Re-improved, Peterkin's, Lewis's Prize, Sea Island (Extra Long Staple), and Tool's Early Improved seemed to be the hardiest and best suited to this climate, in the order, named, as regards growth.

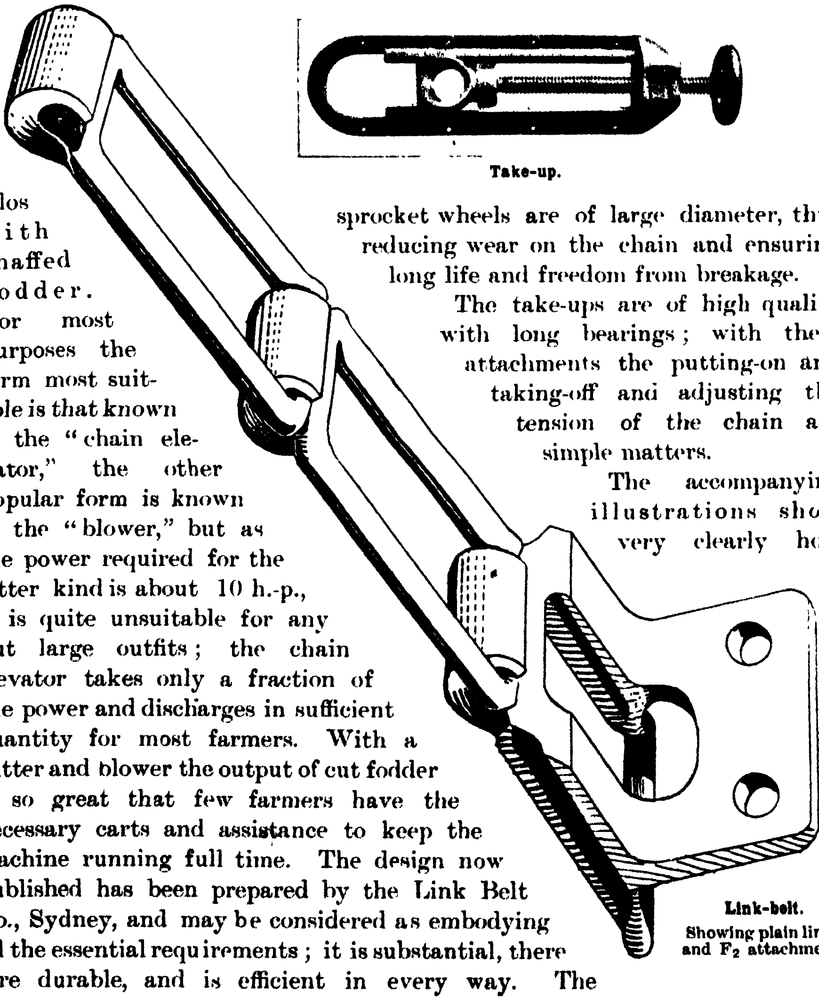
The average yields per acre, reckoning 8,034 plants to each acre, as deduced from the number of plants of each variety from which we pulled cotton, are as shown in the following table:—

Variety.	Percentage of hardy plants to seeds planted.	Average height of plants.		Weight of cleaned cotton per acre (in lb.).	Weight of seed per acre (in lb.).	Number of plants that actually matured and bore, out of 12 left in row.
	per cent.	ft.	in.	lb.	lb.	
1. Russell's Big Ball	88	5	6	927	1390·5	12
2. Sea Island (Short Staple) ..	80	7	6	803·4	1205·1	8
3. Jones's Re-improved	87	6	0	736·5	1154·7	12
4. Carolina	84	5	0	723	1084·5	10
5. Peterkin's	31	4	0	703	1052·1	?
6. Tool's Early Improved... ..	48	3	6	642·7	964	[illegible]
7. Lewis's Prize	87	5	6	535·6	803·4	12
8. Egyptian	31	3	6	511 3	702·9	3
9. Culpippers	80	4	6	502·1	753·2	8
10. Sea Island (Extra Long Staple)	84	5	6	401·7	602·6	10
11. King's Early Improved... ...	87	4	0	401·7	587·5	12
12. Griffin's	86	5	6	365·2	511·3	11
13. Abassi	Nil.	... ..		.. ...	.. ...	......

Elevator for Ensilage.

F. G. CHOMLEY.

THE increasing interest now being manifested throughout the State in ensilage making, particularly in the dairying districts, has given rise to a considerable number of inquiries for information about elevators for filling over-ground



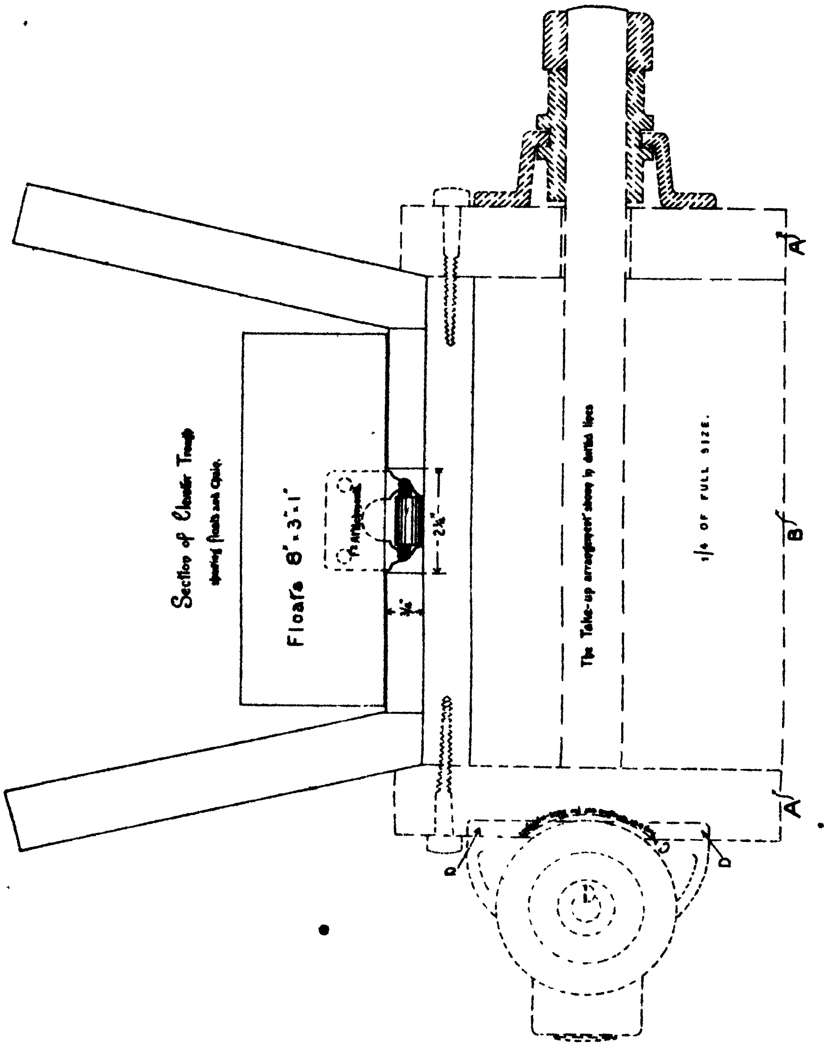
Take-up.

Link-belt. Showing plain links and F_2 attachment.

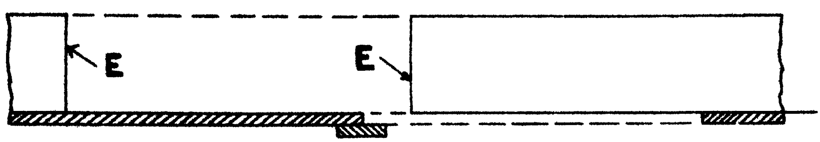
silos with chaffed fodder. For most purposes the form most suitable is that known as the "chain elevator," the other popular form is known as the "blower," but as the power required for the latter kind is about 10 h.-p., it is quite unsuitable for any but large outfits; the chain elevator takes only a fraction of the power and discharges in sufficient quantity for most farmers. With a cutter and blower the output of cut fodder is so great that few farmers have the necessary carts and assistance to keep the machine running full time. The design now published has been prepared by the Link Belt Co., Sydney, and may be considered as embodying all the essential requirements; it is substantial, therefore durable, and is efficient in every way. The sprocket wheels are of large diameter, thus reducing wear on the chain and ensuring long life and freedom from breakage.

The take-ups are of high quality with long bearings; with these attachments the putting-on and taking-off and adjusting the tension of the chain are simple matters.

The accompanying illustrations show very clearly how

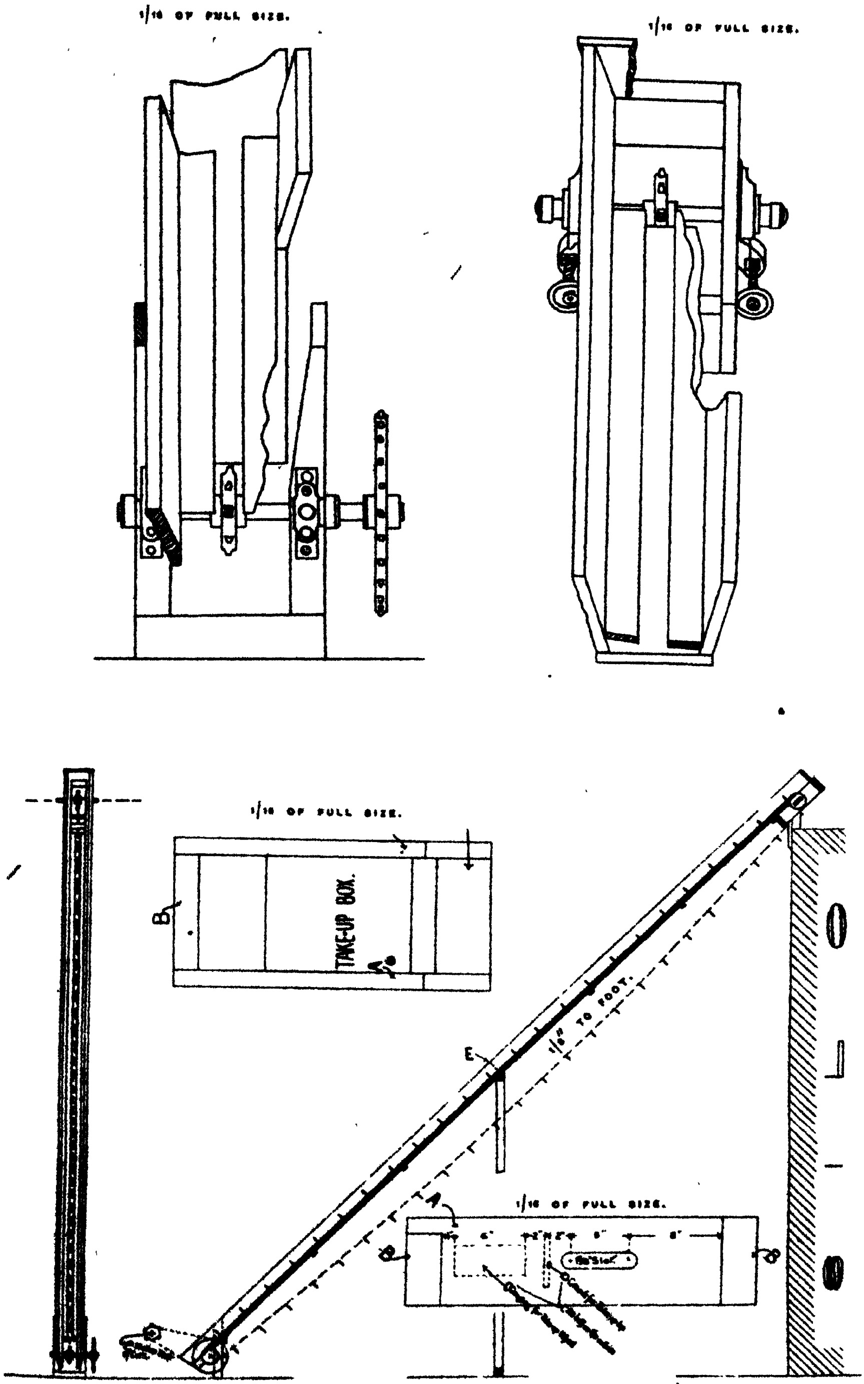


ELEVATOR BOX, 1/16 OF FULL SIZE.



ELEVATOR FOR ENSILAGE.

DESIGNED BY THE LINK-BELT COY., SYDNEY.



ELEVATOR FOR ENSILAGE.

DESIGNED BY THE LINK-BELT COY., SYDNEY.

the wooden frame and elevator-box is constructed; the whole of the drawings are to scale and designed for an elevator with 35 feet centres, suitable for a silo 25 feet high; this allows of the elevator being set at an angle of about 45°. If the silo is higher or lower it would, of course, be necessary to increase or decrease the distance between centres accordingly.

The following is a list of the parts required and the sizes:—

	One 12-inch diameter No. 57 sprocket wheel, 1¼-inch bore K.S.	£9 5s.
Bottom—	Two 1¼-inch light brass bearings.	
	One 1¼-inch wrought iron collars.	
	One 1¼-inch diameter steel shaft, 2 feet long.	
	One 18-inch diameter No. 57 sprocket wheel, 1¼-inch bore K.S.	
Cutter Wheel	One 7½-inch diameter No. 57 sprocket wheel spider.	
	One 12-inch diameter No. 57 sprocket wheel, 1 inch bore S.S.	
	Two 1-inch take-ups.	
Top—	Two 1-inch wrought iron collars.	
	One 1-inch diameter steel shaft, 2 ft. 4 in. long.	
	73 feet No. 57 chain, with F2 every eighth link.	
	One pair of No 57 couplers.	
	100 1½ in. x ¼ in. cupboard bolts for floats.	
	Five 1¾ in. x ⅜ in. cuphead bolts for spider.	
	10 feet No. 57 plain chain for drive.	

In addition to the metal parts there will also be required the following lengths and sizes of softwood—Oregon or pine.

Floats	50 pieces	8 in. x 3 in. x 1 in.
Sides	2 ,,	37 ft. 6 in. x 8 in. x 1¼ in.
Bottom	1 ,,	37 ft. 6 in. x 10¼ in. x 1 in.
,,	2 ,,	37 ft. 6 in. x 3 in. x ¾ in.
,,	1 ,,	10 ft. x 3 in. x 1 in.
Take-up box and bottom-bearing box	4 ,,	2 ft. 6 in. x 8 in. x 1½ in.
	2 ,,	13½ in. x 8 in. x 3 in.
	2 ,,	13½ in. x 6⅝ in. x 3 in.
Supports	3 ,,	16 ft. x 3 in. x 2 in. hardwood.

The cost of the wood work, cut to the above size (undressed), will be about £1 10s.; this will bring the total cost for material to £10 15s.

A cheaper elevator than the above can be constructed by substituting a lighter chain, smaller sprocket wheels, and improvising take-ups, but it is not to be expected that such will give the same satisfaction, nor have anywhere near the same life. Chaffed maize and sorghum are not so easily handled in an elevator as dry chaff, owing to the pieces of stem jambing between the floats and sides; it is, therefore, advisable to provide gear sufficiently rigid to stand the rough usage an elevator is called upon to bear during the hurry of filling the silo, without fear of breakage just at a time when such would cause the greatest loss. A steady running elevator will take less power to elevate the same quantity of fodder than a lighter built one liable to sway and vibrate.

The following sizes of gear-wheels and chain are in use on an elevator, and are giving satisfaction to the user:—

The wheel on the chaff-cutter spindle is 7 inches in diameter, driving on to a 9-inch wheel on bottom spindle, with 4-inch top and bottom wheels on elevator. The size of the chain is No. 45 on the Link Belt Company's list

Weather Conditions during October, 1907.

A. NOBLE,
Meteorological Department, Sydney Observatory.

On the 1st and 2nd a few light showers were recorded in the extreme north-east and south-east portions of the State. On the 3rd, as the result of a monsoonal tongue, extending from Queensland into New South Wales, light to heavy rains were registered over the Upper Barwon tributaries, north-western slopes, and northern tablelands.

Light to moderate rains were also recorded south of a line joining Broken Hill, Carcoar, and Moss Vale. During the 5th a north-easterly element in the winds set in over our north-western districts, showing that a monsoonal development was in operation over Queensland. These conditions resulted in light to moderate but somewhat patchy rainfall over the greater part of the State, the heaviest falls being recorded over the northern tablelands. Showery conditions continued over the northern and southern tablelands and north-west and south-west slopes on the 8th, and extended over the Riverina and parts of the Hunter Valley on the 9th. During the following four days, with the exception of one or two isolated showers, no rain was recorded throughout New South Wales. On the 14th some light to moderate showers, associated with thunder, were recorded at widely-scattered stations, chiefly over central areas. On the 17th light to moderate and scattered rains, the result of thunder, were recorded on the northern tablelands and North Coast. On the 18th a heat-wave passed very rapidly over the State, the highest temperature registered being 104 degrees at Wilcannia and White Cliffs, respectively. On the 21st light to moderate rain, with thunder, was recorded over southern districts east of Hay, on coastal areas and tablelands, and also over Barwon tributaries as far west as Hungerford. On the 22nd and 23rd comparatively cool weather ruled throughout; at some stations the temperature fell below freezing point, Nimitybelle registering 28 and Carcoar and Kiandra each 30 degrees. On the 28th, 29th, and 30th light to moderate and in isolated cases heavy rain was recorded over the tablelands, western slopes, and parts of north-western districts. On the 31st the best rainstorm for the month was recorded, the falls being light to moderate and general, with the exception of the North Coast and some stations in the far north-west.

The following statement shows a brief comparison of the chief meteorological elements over India, together with Australia, as far as data are available, for the month of October, 1907 :—

	Departure from normal.		General Conditions (referring to State as a whole).
	Pressure.	Temperature.	
	Inch.	Degrees.	
India...	- ·01	+1·7	Extremely dry.
Sydney ...	- ·02	+1·8	Dry.
Melbourne ...	- ·04	-0·7	Dry.
Perth ...	+ ·01	·0·9	Above normal in S.W., normal elsewhere
Adelaide ...	- ·02	-0·2	Dry.

Although October may be classified as a dry month, it shows an improvement on the preceding one. This was largely due to a general rainstorm, which passed over towards the end of last month, whereby all parts of the State benefited. Taking the month of October as a whole, rainfall over the State was much below the average, the greatest defects being over the western plains and coastal districts, where the deficiencies were from 50 to nearly 100 per cent. below normal.

The distribution over the various subdivisions of the State was as follows :—

Division.		Percentages. Above normal.		Below normal.
Over North Coast ...	from ...	—	...	24 to 84
,, Hunter and Manning	,,	—	...	45 ,, 97
,, Metropolitan area	,, ..	—	...	77 ,, 95
,, South Coast	,, ..	—	...	50 ,, 93
,, Northern Tableland	,, ..	23	to	75
,, Central Tableland	,, .	—	...	11 to 80
,, Southern Tableland	,, .	—	..	40 ,, 94
,, North-western Slopes	,,	—	...	26 ,, 93
,, Central-western Slopes	,, .	—	...	50 ,, 90
,, South-western Slopes	,,	—	...	33 ,, 66
,, North-western Plain	,, .	-	..	24 ,, 84
,, Central-western Plain	,, .	31	to	87
,, Riverina	,,	—	..	39 to 83
,, Western Division	,,	17	,,	100

Orchard Notes.

W. J. ALLEN.

DECEMBER.

Exported Oranges and Lemons.—A few cases of oranges and lemons were sent to Vancouver and Seattle in September last, and were landed in good condition at their destinations. At Vancouver the lemons sold at 14s. 7d. per case, while the oranges brought 12s. 6d.; and at Seattle (Washington Territory) lemons brought 10s. 6d. per case and oranges 12s. 6d. The cases held a bushel, or 2,220 cubic inches. I feel sure that before long we will find sale annually for a good many thousand cases of fruit in these markets—that is, for our best fruits, viz., Washington Navel, Late Valencia, and Jaffas.

Irrigation.—Where irrigation is practised it will be found necessary in most cases to give the soil a good soaking this month. Where young trees or vines are being watered, see that the soil is well soaked around their roots, and as soon as the ground is dry enough after the watering, cultivate the land thoroughly and work around the trees and vines with a fork hoe.

Fruit-curing.—Apricots will be the principal fruit for curing this month. See that the fruit is perfectly ripe before picking, then cut them evenly, fumigate, and put them out in the sun with as little delay as possible. Do not cure them too much, but take them in when yet quite pliable, after most of the moisture has left them. Pamphlets on curing fruit may be had on application to the Department of Agriculture, which will give all details in connection with this important work. (Fruit-drying, *Miscellaneous Publication, No.* 919, Canning and Bottling, No. 999.)

All orchard land should be kept free from weeds, and to this end the horses and cultivators should have but little rest this month, as an orchard neglected for a few days will soon be covered with a coating of summer grass, which will take many a hard day's work to eradicate; and couch grass spreads rapidly when left undisturbed. Where there are bad patches of couch grass, these should be ploughed up and harrowed on a very hot day, as the roots soon die when exposed to the sun.

Passion vines which have been properly pruned and manured during November will now be putting on good growth and blooming freely. This fruit will be ready to meet the demand at Easter, when it usually finds a ready sale at good prices.

Keep a strict lookout for pests, and if trees have not been fumigated or sprayed, as the case may be, the grower should lose no time before beginning to fight them.

For scales on citrus trees, December, January, and February are good months for either spraying or fumigating; but for fungus diseases it is generally best to spray once before the trees bloom and again as soon as the fruit has set, rather than leaving it until now. In many cases, however, later sprayings are both beneficial and necessary. The grower should not neglect to either fumigate or spray all citrus trees, so as to ensure clean fruit and healthy trees.

Codling Moth.—Keep a strict watch over all bandages on the apple, pear, and quince trees, and see that all fruit is picked up and destroyed either by feeding it to stock immediately or boiling or burning it; but not by burying it, as a few of our careless growers have tried to do. It is to the interest of every grower to see that every grub is destroyed before it can fly. The man who buries his fruit is only breeding moths for himself and his neighbours, and therefore we hope that, in the interests of the fruit industry, any growers found resorting to this means of disposing of their fruit will be reported to the inspectors, and made an example of. We hope that the growers will assist the inspectors in every way possible, and where they know of those who are trying to evade the Act, they will report them.

Fruit Fly.—As soon as this pest makes its appearance, set kerosene traps around the trees or hang them in the trees. These traps are tins about 5 or 6 inches square, 2 inches deep, with a ½ inch of kerosene in the bottom. Pick up and boil or burn all fallen and infested fruit every day.

In tropical districts pine-apples may be planted if moist weather prevails. Suckers are the best to plant, being much the strongest and earliest to arrive at maturity. Being great feeders, a dressing of strong nitrogenous fertiliser will promote rapid growth and fine fruit. While the plants are young, cultivation must be thorough, but not deep enough to cut the feeding roots, which are near the surface.

Bananas and other tropical fruits may also be planted during the rainy season.

The dry weather on the coast is still the cause of great anxiety to most of our growers, and in many cases the prospects for the coming season's citrus crops are anything but promising.

Exporting Apples.—I would like to see the Cumberland apple-growers exporting a few cases of their apples this season. Perhaps the Fruit-growers' Union could arrange for a hundred cases to be sent the latter part of February or early in March. It will be a great boon to the Cumberland growers if they find they can successfully export this fruit.

A reader of the *Agricultural Gazette*, who signs himself "Beginner," wishes information *re* apple culture, varieties of fruits suitable for canning, drying and canning, has, on two pages of paper, given me a big order. If he would kindly communicate with me, giving me his name and address, I would be pleased to meet him and give him the information he desires; but, owing to pressure of work, I feel that I will not be able to publish the required information for some months. My article on fruit-drying and commercial fruits of New South Wales will give him much of what he requires, and both can be had on application to the Department.

Practical Vegetable and Flower Growing.

W. S. CAMPBELL.

Directions for the Month of December.

Vegetables.

French market-gardeners are acknowledged to be exceedingly skilful in growing vegetables, and raise enormous quantities of vegetables of high quality off quite small areas of land, depending chiefly on stable dung for their good results. In a recent number of the *Journal d'Agriculture Pratique,* an article, referring to the use of chemical fertilisers in vegetable cultivation, appeared. This is interesting and useful, and worth reproduction here. The writer says:—

"We know what care and attention the market-gardeners in France bestow on their cultivations. They neglect no precautions nor the smallest detail which may enable them to produce the splendid specimens which are admired everywhere; yet, very often we are asked how a still better result may be obtained in the vegetable garden. It is a point on which many desire to still further perfect their methods.

"Besides the organic manures and soils which they ordinarily use, we should advise the more frequent employment of chemical fertilisers, as, for instance, phosphates and potassic manures, for these have shown their value in cultivations on a large scale, and have rendered incontestable services in increasing the fertility of the soil, and at once improving the yield and quality of the crops. They will be found just as useful in vegetable cultivation, where at present little are used, although some gardeners have already begun to experiment with them among their vegetables.

"As they have been found to be a great success, it is desirable that the practice should become more general. By adding superphosphates or kainit, or sulphate of potash to the usual manure, vegetation becomes more rapid, the work is more advanced, and the legumes are of superior appearance, besides being larger and of better quality. It is a recognised fact that the phosphate manures forward the development of fruit, and advance its maturity.

"Potassic manures act in the same way, and their action is particularly noticeable in a time of drought, like that which we have just experienced.

"Owing to their hygroscopic properties, they maintain more humidity in arable lands, and their fertilising value, together with their influence in the assimilation of other components of the soil, increase the vigour of the plants.

"In many places it has been noticed, for instance, that potatoes which received potassic manures remained green, whilst the others had yellowed wherever potash had not been applied.

"In Normandy, M. Levavasseur, having tried the potassic manures on haricots, stated that 'the manure, spread very early, acted immediately on the vegetation; the portions manured—above all, with potash—having resisted in a remarkable manner the drought, which destroyed all the fields of haricots in the same district.' The use of phosphate and potassic fertilisers thus presents numerous advantages in vegetable cultivation. Besides the fact that it will be able by this practice to overcome the pernicious effects of drought, it will also allow of the crop being gathered fifteen days or a month earlier, whilst obtaining legumes larger and heavier.

"Their sale will, therefore, be more certain and more remunerative, and the soil will be sooner at liberty for another crop.

"Respecting the quantities to be employed and the kind to be preferred, bone-superphosphates seem to give the best results in doses of 8 to 12 cwt. per hectare (2½ acres). As for potassic manures, sulphate of potash may be used in doses of about 4 cwt. per hectare. These may be applied either immediately after the ordinary manure has been dug in, or a little later on, with a superficial working of the soil."

The prospects of good weather conditions for vegetables have improved considerably during the month of November, and so much so that there is likely to be good supplies available for use during the current month.

Beans, French or Kidney.—Should be producing large quantities of nice young pods in the pink of perfection, and if the pods are gathered whilst tender, the beans will continue to produce more and more for some time. A few plants may be kept for seed production, and from them no pods should be gathered, but all should be allowed to ripen. Any old beans which have ceased to bear should be removed, and the ground cleaned up, manured well, and made use of for anything other than for plants belonging to the same order of plants as beans. Roots, cabbages, lettuces, tomatoes, would do very well for rotation.

In order to keep up a succession of beans, a few seeds may be sown during the month.

Broccoli.—Any seedlings on hand can be pricked out, and plants which have been pricked out and are well grown may be planted. The ground for these plants should be well manured. If the weather should be dry, water the young plants before lifting them, and when they are planted water again. Sow a little more seed if more seedlings are required.

Borecole or Kale.—Sow a little seed and keep the ground moist after the seed is sown. A light frame had better be kept over these seeds, and also over any other kinds of seeds sown in seed beds or boxes. Small frames made out of a bran bag or something of that kind will answer the purpose very well indeed.

Cabbage.—Sow a small quantity of seed, and plant out good well-grown seedlings that have been pricked out.

Cauliflower.—Obtain some good seed, and sow a little of it in seed bed or box.

Cucumber.—Cucumber fruit should be abundant by this time after the rains. Gather all the cucumbers before they ripen, unless it be desired to save seed. If more plants are needed, sow seed.

Celery.—Always keep on hand a small stock of strong, well-grown young celery plants for putting out as required, and sow a little seed occasionally. Earth up, or cover up with boards, pea or bean vines, dead grass or dead leaves, the stems of well-grown celery plants.

Cress and Mustard.—Keep these plants going as long as possible, for they are useful during the summer.

Egg-plant.—Seed may be sown if more plants are needed.

Maize, Sugar or Sweet.—A few seeds may be sown in nearly all districts. In small gardens, this vegetable may take up space which might be made better use of by other and more appreciated vegetables.

Onion.—A little seed may be sown in drills, if the soil is in a sufficiently moist condition, for it would be inadvisable to sow if the ground is dust-dry.

Parsley.—A few seeds may be sown, unless there are sufficient plants growing. This is a valuable plant, and should never be overlooked.

Peas.—Except in cool districts, where the rainfall has been good, seed had better not be sown.

Pumpkin.—Probably the plants already growing will suffice for all purposes. This is a useful vegetable, and worth raising in good quantity, for pumpkins will keep good through the winter if kept in well-open sheds where the ventilation is good.

Radish.—Sow a little seed occasionally.

Sweet Potato.—Keep cultivating growing plants, and, if necessary, plant out more rooted cuttings.

Spinach.—Sow a little seed, in order to keep up a sufficiency of this useful vegetable.

Tomato.—Fruit should be ripening well by this time in the cool districts. Seed may be sown where plants are needed, and seedlings may be planted out anywhere. Do not allow any fruit to rot and lie about the ground, for that will encourage the growth of pests of all sorts.

Turnips.—Sow a little seed in drills, and thin out the seedlings well as soon as they are strong and well grown.

Flowers.

Dahlias and chrysanthemums will need a good deal of attention during hot weather, especially if it is dry, for watering will be necessary to keep the plants in full growth, or they will flag, and perhaps die away. These two flowering plants are important ones for the autumn flowering, and consequently are deserving of some care in the growing. Both plants will be much improved by the application of some liquid manure from time to time; and that kind of manure can easily be made by soaking cow, horse, pig, sheep, or poultry dung in water. A sugar-bag or bran-bag filled with the dung and put into a tub of water is about the best way to manage. Soot treated in the same manner makes an excellent liquid manure, and a useful one for chrysanthemums. Roses will, most likely, flower profusely during the month, and especially so if the weather is moist. The kinds likely to flower best are the hybrid tea, the teas, and Bourbon roses. Unless the soil is of very good quality, the plants will be improved by application of liquid manure—say, 2 gallons at a time to each plant.

Farm Notes.

HAWKESBURY DISTRICT—DECEMBER.

H. W. POTTS.

DURING the corresponding season of last year it was noted by the writer that the hay yield was the lowest on record, as well as the rainfall, since 1862. Apart from the weirdness of this testimony, it has its practical object-lesson, and assists to contribute evidence for the future guidance of our farmers in meeting similar seasons. Droughts are inevitable. Our business as farmers is to so regulate and design our methods of agriculture to suitable selection of crops as to carry on systematic efforts in securing food for man and stock under prevailing Australian conditions.

The record of last year is broken this season. Our rainfall in the four months in which the subsoils usually replenish their stores of moisture was again noted for its scarcity. During July, August, September, and October, only 114½ points of rain fell, with 65½ points in November. The beneficent effect of each fall was practically nullified by the immediate rapid evaporation created afterwards by continuous westerly winds.

The hay crops in consequence were lighter than last year. Two prominent crops were brought again under favourable contrast this season under drought hardships of exceptional severity—wheat and lucerne.

The crops of oats, in so far as hay production was concerned, were a failure. They broke into flower at a height of 4 to 6 inches, and had to be eaten off by stock.

Usually under less adverse circumstances, rye, on our loose, sandy, poor loams, has provided a crop of grain; but it succumbed this season, and had to be grazed.

The wheat crops for hay, especially the early-sown ones, again evidenced the hardiness of the plant and its power to withstand drought. Although it ripened a month earlier, yet the crops yielded from 5 cwt. to 1 ton to the acre.

No better demonstration could be given of the powers of endurance possessed by lucerne, and its inherent sturdiness, than that noticed on the College farm this season. The four paddocks laid down with this excellent fodder responded promptly to every light shower, and afforded a nutritious picking for the dairy cattle at a period when all the natural grasses were lying dormant. Anyone personally acquainted with the

class of soil of which these paddocks are composed cannot but be impressed with this excellent feature. It adds one more qualification to this stock fodder. So far, no crop has been cut this season, and we were compelled to buy lucerne.

This in itself provided another point of value in the records of a dry season in the feeding of dairy stock and the prominence given to the position ensilage occupies as a profitable roughage during a dry season, and its economic application.

On page 355 of last year's *Gazette* the writer stated: "The present sequence of good seasons emphasises the urgency of making provision for the inevitable periods of drought, with their concomitant evils and scarcity of fodder." This was intended to apply to the State as a whole, because the Hawkesbury district, with a small area along the coast-line, was suffering from drought. During the early part of February last year 118 points of rain fell, and advantage was taken of this at the end of a dry season, when the ground was warm, to hurriedly sow 60 acres of maize for ensilage. The varieties selected were Hickory King and Red Hogan. The quantity sown was 10 lb. seed to the acre. Harrowing followed; and later, shallow cultivation every second week. The risk was taken with regard to early frosts. Fortunately, we had a late winter, and the temperature remained favourable to growth, without a check, until the middle of May, when a crop of from 4 to 5 tons to the acre was taken off. At the same time a crop of Hungarian millet was grown, and gave a return of 4 tons to the acre. These crops, with others grown on the farm, gave us sufficient food to make 720 tons of ensilage, which was conserved in tub, pit, and stack, all of which turned out in excellent order.

The average cost of growing this green crop and stacking it runs out at about 5s. per ton; that is, charging all labour and other items at ordinary market rates. It has never been more than 5s. 10d. So that, after loss of weight, it is still the cheapest fodder that can be provided. The College dairy herd, which is running in bare paddocks, is being fed on the following average daily ration per cow:—

Ration.	Dry Matter.	Protein.	Carbo-hydrates.	Fat.
35 lb. maize ensilage ..	8·75	·455	4·72	·21
6 lb. lucerne hay ..	5·34	·74	2·23	·09
4 lb. bran	3·53	·45	1·69	·1
	17·62	1·645	8·64	·4

This gives a nutritive ratio of 1 : 5·79.

With ensilage at 10s. per ton, lucerne at £6 10s. per ton, bran at 1s. 9d. per bushel, grass rent at 4d. per week, and milking labour calculated on the basis of £2 per cow per year, the cost is 12·12d. per cow

per cent. butter-fat, and this is produced at a cost of 5·91d. per gallon of $10\frac{1}{4}$ gallons per day. The average daily yield of milk per cow is 21 lb., testing 3·9. At 10d. per gallon the milk shows a profit of 4·09d. per gallon, and a daily profit of 8·22d. per cow. If used for cheese, 9·9 lb. of this milk would make 1 lb. of cheese, which, at 9d. per lb., would represent 1s. 7·09d. per cow daily, and after deducting 1d. per gallon for manufacture would give a profit of 2·4d. per gallon, and a daily profit of 4·91d. per cow.

It may be noted that the price given for milk on trucks, Richmond, is high; but this is in proportion to the normal price of feed. Where the advantage is so apparent is in the useful and profitable position ensilage occupies as a dairy fodder.

Maize.—The few showers which fell last month were insufficient to maintain vigorous growth in the early-sown crops, owing to the prevalence of winds immediately following the rainfall. The attention demanded now to keep the crops growing is most urgent. Every maize-grower realises at all times the advantage of cultivation; but this season our moisture conditions are such as to demand incessant shallow cultivation in order to prevent a check in the growth of the plant through the soil becoming crusted or the growth of weeds. The aim is to stimulate steady growth. The plants are not sturdy or thrifty this season; but whilst the colour remains good as it is we are justified in expecting a valuable green fodder crop for stock about Christmas. Opportunity must be seized after every shower, irrespective of its lightness, to keep up shallow cultivation, and prevent the surface soil caking.

The existing drought and dry subsoils should not deter the farmer from anticipating a crop of grain, even if failure is evident. Heavy thunderstorms may fall and ensure sufficient moisture.

This month further crops of both grain and fodder producing varieties may be sown. For the former, with a probable yield of grain in May or June next, the best sorts are Early Mastodon, Pride of the North, Iowa Silvermine, Riley's Favourite, and Golden King. The quantity of seed is 7 lb. to the acre, sown in drills 4 ft. 6 in. apart, and with the single-grain system in distances of 12 to 16 inches.

In the case of raising a maize crop for green fodder or ensilage the following varieties are recommended:—Red Hogan, Hickory King, and Hawkesbury Champion. The quantity of seed to sow should be about 12 lb. to the acre. In some instances it may reach 15 lb. The drills should be 3 ft. 6 in. apart, and for this crop the plate of the dropper should be set to drop two seeds each time, at a distance of 9 inches.

Sorghums.—With early attention to the cultivation of the plant during the dry weather, this crop always affords ample evidence of its use as a green fodder towards the end of summer and the commencement of winter. Further sowings may be made this month of Sorghum Saccharatum, Early Amber Cane, or the Imphee varieties, amongst the best of

which is Planters' Friend. The rows should be 3 ft. 6 in. apart, and the seed drilled in up to 9 lb. to the acre.

Millets.—Hungarian and White French millets may have attention, and are suitable at this period for sowing for green fodder towards the end of summer.

With maize, sorghum, and millet cultivation it will be advantageous to add a complete manure of a ready soluble nature in order to release plant food with the lowest quantity of moisture. The following may be used:—

Dried blood	400 lb.
Sulphate of potash	220 lb.
Superphosphate	500 lb.

Add this at the rate of 1½ cwt. to the acre.

Cowpeas.—We cannot afford to overlook the succulent cowpea in such a season as this. Our past experience points to its great value in February and March as green feed for stock. The stubble, after removal of the hay crops, can be ploughed in, and the land got into fine condition. The peas should be planted in drills 3 feet apart and 6 to 8 inches in the row from each other. Use 7 to 10 lb. to the acre. The best manure this season will be—

Sulphate of potash	220 lb.
Superphosphate	600 lb.

and apply 2 cwt. to the acre.

The varieties giving the heaviest crops are White, Black, Warren's Extra Early, Warren's New Hybrid, Upright, Iron, Clay Coloured, and China.

Sweet Potatoes.—The main crop may now be planted where the ground is well cultivated, and given a good heavy dressing of farm-yard manure.

Root Crops.—The late sowings of mangolds and sugar-beets may now be made. The earlier crops will require thinning, weeding, and cultivation.

Pumpkins, Melons, Squashes, Marrows, and Grammas.—Where sufficient moisture can be secured to grow these very serviceable fodder crops they ought to have more attention. We require a change of food for sheep, pigs, and cattle during the hot weather, and these prove palatable at all times to stock.

Glen Innes District—December.

R. H. Gennys.

Sorghums may be sown for green fodder and for ensilage. The two best varieties for this district are Early Amber Cane and Planters' Friend; the latter is a great favourite with dairymen, though here Amber Cane has been

the larger cropper. Sorghum, if drilled, may be sown at the rate of 8 lb. or 9 lb. per acre; if broadcast, about 14 lb. will, generally speaking, prove ample.

If the crop is to be fed straight to the cattle they do not waste so much if the stalks are fine, so it is advisable to sow thicker in this connection than if the crop is intended for the silo.

Millets may be sown for hay and for green fodder. Hungarian and New Siberian are both good hay-sorts. Pearl Millet stools well and yields an abundance of green feed.

Do not allow cattle to feed on the young growth of Sorghums, either on first or second growths, as at both stages they have proved on many occasions fatal to stock; probably this is through an excess of prussic acid in the young plant. When once the plant comes into head, however, it may be fed freely without the slightest danger.

Potatoes may still be planted for the main crop. Centennial, Irish Flounder, Manhattan, and Brownell's Beauty have all done well here, and are good keepers.

Good-sized seed free from blemishes should always be used; never sow too small, nor ill-shaped, seed; see also that no disease is present.

Oats may be fit to harvest this month. Generally when the tops begin to turn white it is fit to cut; let the grain form somewhat in oats, but not in wheat; cut the latter when in flower. The grain of wheat is not very digestible in its raw state, and it is far better to have all the nutriment distributed in the straw, which will be sweeter, more digestible, and a better marketable colour.

Pumpkins may still be sown in New England, though it is getting late. Grammas are good feed for stock, and grow well under ordinary cultivation.

Crown, *Ironbark*, and *Hubbard Squashes* are all good table varieties and fine keepers. Be sure and keep down weeds, and it is as well to plant so that the cultivator may be freely used in the first stages of growth.

All summer crops, where practicable, should receive frequent shallow cultivation.

Orchards should be kept free of weeds, and cultivated occasionally to conserve moisture.

Experiments with Peas.

F. C. KING,
Gardener, Wollongbar Experimental Farm.

Four varieties of peas were forwarded here to be tested. All the four varieties were grown on the same piece of ground, which was very stony, and no manure was used. During the time they were growing, ninety-nine dry days and nights, and thirty-one showery days and nights, occurred.

Carter's Early Morn.—Seed sown, 9th May, 1907; started to flower, 15th June; ready to pick, 23rd July.

Carter's Daylight.—Seed sown, 9th May, 1907; started to flower, 15th June; ready to pick, 23rd July.

Carter's Mayflower.—Seed sown, 9th May, 1907; started to flower, 24th June; ready to pick, 3rd August.

Carter's Buttercup.—Seed sown, 9th May, 1907; started to flower, 9th July; ready to pick, 22nd August.

Three varieties—Early Morn, Mayflower, and Buttercup—have given good results.

Daylight grew very straggling, producing only a few pods on each haulm. A variety unsuitable for this district.

Mayflower.—A very dwarf variety, producing plenty of nice pods, with five to seven peas in each.

Early Morn.—An excellent variety, very prolific, producing nice pods of six and seven peas in each, on rather thin haulms.

Buttercup.—The best variety; robust growth; very prolific; handsome pods, with nine to eleven peas in each, of excellent flavour.

Considering the dry weather they experienced, the above results speak very highly of the varieties. All the pods have been saved for re-sowing and distribution purposes.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Sub-Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1908.

Society.	Secretary.	Date.
Dapto, Unanderra, A. and H. Society	Geo. Lindsay	Jan. 8, 9
Albion Park A., H., and I. Society	H. G. Frazer	,, 15, 16
Berry Agricultural Association	A. J. Colley	,, 21, 22, 23
Central Cumberland A. and H. Ass. (Castle Hill)	H. A. Best	,, 22, 23
Kiama Agricultural Association	J. Somerville	,, 25, 27
Coramba P., A., and H. Society	H. Hindmarsh	Feb. 5, 6
Wollongong A., H., and I. Association	J. Beatson	,, 6, 7, 8
Alstonville A. Society	Wm. W. Monaghan	,, 12, 13
Moruya A. and P. Society	John Jeffery	,, 12, 13
Gunning P., A., and I. Society	W. T. Plumb	,, 13, 14
Camden A., H., and I. Society	A. Thompson	,, 19, 20, 21
Kangaroo Valley A. and H. Association	E. G. Wilkinson	,, 20, 21
Pambula A., H., and P. Society	J. B. Wilkins	,, 21, 22
Southern New England, Uralla	W. C. McCrossin	,, 25, 26
Campbelltown A., H., and I. Society	A. R. Payten	,, 26, 27
Ulladulla A. and H. Association	C. A. Buchan	,, 26, 27
Robertson A. and H. Association	A. G. Ferguson	,, 27, 28
Manning River A. and H. Association, Taree	S. Whitehead	,, 27, 28
Newcastle A., H., and I. Association	C. W. Donnelly	,, 27, 28, 29
Bega A., P., and H. Society	W. A. Zuegel	Mar. 4, 5
Braidwood P., A., and H. Association	L. Chapman	,, 4, 5
Yass P. and A. Association	Will. Thomson	,, 4, 5
Tenterfield P., A., and Mining Society	F. W. Hoskin	,, 4, 5, 6
Berrima A., H., and I. Society, Moss Vale	J. Cullen	,, 5, 6, 7
Wyong Agricultural Association	W. Baldwin	,, 6, 7
Bombala Exhibition Society	W. G. Tweedie	,, 10, 11
Bangalow A. and I. Society	W. H. Reading	,, 10, 11, 12
Glen Innes and Central New England P. and A. Ass.	Geo. A. Priest	,, 10, 11, 12
Tumbarumba and Upper Murray P. and A. Society	E. W. Figures	,, 11, 12
Nambucca A., H., and I. Association, Bowraville	Clifford Moseley	,, 12, 13
Nepean A., H., and I. Penrith	Percy Smith	,, 12, 13
Port Macquarie and Hastings District A. and H. Soc.	Thos. Dick	,, 12, 13
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Hunter River A. and H. Association (West Maitland)	C. J. H. King	,, 24 to 27
Orange A. and P. Association	W. Tanner	,, 25, 26, 27
Clarence P. and A. Society, Grafton	Thos. Bawden	Apl. 1, 2
Durham A. and H. Association (Dungog)	C. E. Grant	,, 1, 2
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Bathurst A., H., and P.	W. G. Thompson	,, 1, 2, 3
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Mudgee A. Society	H. Lamerton	,, 7, 8, 9
Cooma P. and A. Association	C. J. Walmsley	,, 8, 9
Upper Hunter P. and A. Association (Muswellbrook)	Pierce Healy	,, 8, 9, 10
The Royal Agricultural Society of N.S.W.	H. M. Somer	,, 14 to 22
The Central Australian P. and A. Ass., Bourke	G. W. Tull	May 20, 21
Deniliquin P. and A. Society	L. Harrison	July 18, 19
Murrumbidgee P. and A. Association	A. F. D. White	Aug. 25, 26, 27
Young P. and A. Association	G. S. Whiteman	,, 8, 9, 10

[3 Plates.]

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